

HE  
18.5  
.A34  
no.  
DOT-  
TSC-  
NHTSA-  
78-12

RT NOS. DOT-TSC-NHTSA-78-12

HS-803 328

## PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES

First Series - Report No. 18  
1976 Ford 400 CID (6.6 Liters), 2V

W. F. Marshall  
K. R. Stamper

U.S. DEPARTMENT OF ENERGY  
BARTLESVILLE ENERGY RESEARCH CENTER  
P.O. Box 1398  
Bartlesville OK 74003



MAY 1978  
INTERIM REPORT

Dept. of Transportation  
OCT 4 1978  
Library

DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC  
THROUGH THE NATIONAL TECHNICAL  
INFORMATION SERVICE, SPRINGFIELD,  
VIRGINIA 22161

Prepared for  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
Washington DC 20590

NOTICE

Work reported herein was done under sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

NOTICE

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

1. Report No.  HS-803 328	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle  PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES First Series - Report No. 18 1976 Ford 400 CID (6.6 Liters), 2V		5. Report Date  May 1978	
7. Author(s)  W. F. Marshall and K. R. Stamper		6. Performing Organization Code	
9. Performing Organization Name and Address  U.S. Department of Energy* Bartlesville Energy Research Center P.O. Box 1398 Bartlesville OK 74003		8. Performing Organization Report No.  DOT-TSC-NHTSA-78-12 BERC/OP-77/52	
12. Sponsoring Agency Name and Address  U.S. Department of Transportation National Highway Traffic Safety Administration Office of Research and Development Office of Passenger Vehicle Research Technology Assessment Division Washington DC 20590		10. Work Unit No. (TRAIS)  HS827/R8402	
15. Supplementary Notes  *Interagency agreement with:		11. Contract or Grant No.  RA-75-10	
		13. Type of Report and Period Covered  Interim Report August 1977	
		14. Sponsoring Agency Code	
16. Abstract  Experimental data were obtained in dynamometer tests of a 1976 Ford 400 CID, 2V engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine-operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.			
<div style="text-align: right; border: 1px solid black; padding: 10px; margin-top: 20px;"> <b>Dept. of Transportation</b>  <div style="border: 1px solid black; display: inline-block; padding: 5px; text-align: center;">OCT 4 1978</div>  <b>Library</b> </div>			
17. Key Words  Fuel Economy Auto Emissions	18. Distribution Statement  DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161		
19. Security Classif. (of this report)  Unclassified	20. Security Classif. (of this page)  Unclassified	21. No. of Pages  56	22. Price



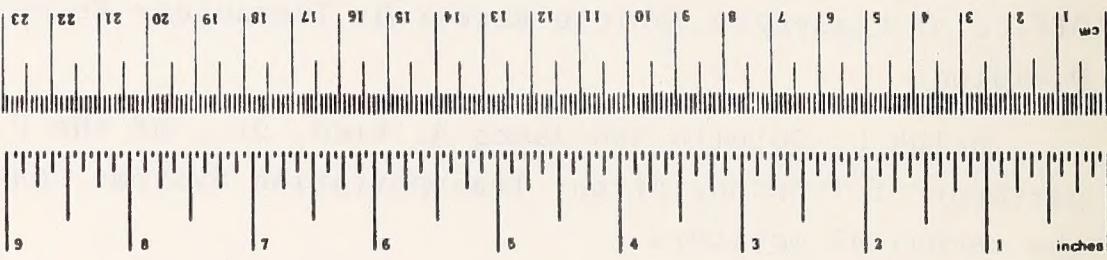
## PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Research Center, for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the U.S. The engine used in this work is one of a series of 23 engines to be tested in the current program. This is the eighteenth of the reports to be published covering work with those engines.

This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

Ralph G. Colello and James A. Kidd, Jr., of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.

METRIC CONVERSION FACTORS



## Approximate Conversions from Metric Measures

## 1. INTRODUCTION

This report presents data acquired from tests of a 1976 Ford 400 CID, 2V engine. Ford uses this engine in Ford and Mercury full-size vehicles (Custom, LTD, etc.). The test results are sufficient to establish steady-state maps for engine performance, fuel consumption, and emission rates (carbon monoxide, unburned hydrocarbon, and oxides of nitrogen) over the entire operating range of the engine.

The objective of the program is to provide engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of this work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

## 2. ENGINE TEST REPORT

General engine specifications for the Ford 400 CID, 2V engine are given in table 1. The engine break-in (table 2) and tests were run using a single batch of unleaded regular grade gasoline; a fuel analysis is given in table 3.

The engine break-in and tests were conducted with a new mean-tolerance engine mounted on a test stand and coupled to an eddy-current dynamometer. The engine was complete with the exception of a fan, and a cooling tower was used in place of the radiator. The engine was equipped with an alternator, but it was not wired into the engine's electrical system. The operative emission control systems included an oxidation catalyst, exhaust-gas-recirculation (EGR), and air injection.

The engine was operated at various speeds and loads designed to approximate road-load conditions over a 45-hour period for break-in (see table 2). The engine tests began on 25 May, and ended on 17 June 1976, giving a total engine operating time of approximately 110 hours. The engine was tested while operating at the following steady-state modes:

Speeds: 850; 1,000; 1,600; 1,800; 2,200; 2,600; 3,000; 3,500 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full load  
(Repeated at 10, 25, 40, 75, 100 pct of full load for all speeds except 3,500 rpm)

Idle speed loads: 0, 1.5, 3.0 bhp (Repeated at each condition)

Total number of test modes.....	70
Total repeats.....	41
Total number of tests.....	111

The following data were recorded at each test point:

Test number	
Date	
Barometric pressure, mm Hg	
Dewpoint, °F	
Inlet air temperature, °F	
Speed, rpm	
Torque, lb-ft	-- BLH strain gage load cell; Daytronics indicator
Fuel rate, lb/hr	-- Fluidyne positive displacement fuel flowmeter
Ignition timing, °BTC	
Manifold vacuum, in. Hg	
Throttle angle, deg	
CO, pct	-- Beckman NDIR

$\text{CO}_2$ , pct - Beckman NDIR  
 $\text{O}_2$ , pct -- Beckman polarographic detector  
 $\text{HC}$ , ppmC -- Custom-built heated flame ionization detector  
 $\text{NO}_x$ , ppm -- Thermo-Electron chemiluminescent detector  
 Oil temperature, °F  
 Oil pressure, psig  
 Coolant temperature, °F  
 Exhaust temperature, °F  
 Exhaust pressure, in.  $\text{H}_2\text{O}$   
 Intake manifold temperature, °F.

The computed data include absolute humidity (grains per pound dry air), power (bhp), air-fuel ratio (includes air injection), and emission rates of carbon monoxide ( $\text{CO}$ ), unburned hydrocarbons ( $\text{HC}$ ), and oxides of nitrogen ( $\text{NO}_x$ ) in grams per hour. The following equations were applied in the computations:

$$W = \exp 12.02 \left( \frac{D - 1.4}{D + 212} \right),$$

$$H = \frac{4348 W}{B - W},$$

$$P = \left( \frac{N \times T}{5252} \right) \left( \frac{736.6}{B - W} \right) \left( \frac{t + 460}{545} \right)^{0.5},$$

$$\text{A/F} = 4.895 \frac{(CO) + 2(CO_2) + 2(O_2) + \left( \frac{NO_x}{10^4} \right) + 3.148(CO_2) \left( \frac{CO + CO_2}{CO + 3CO_2} \right)}{(CO) + (CO_2) + \left( \frac{HC}{10^4} \right) 1 + 0.03148(CO_2) \left( \frac{CO + CO_2}{CO + 3CO_2} \right)}.$$

The equation for A/F is based on:

$$\text{Fuel} = \text{CH}_2.099,$$

$$\text{Water-gas-shift equilibrium constant} = \frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3,$$

HC was determined on a raw exhaust, wet basis, all other species measured on a dry basis.

$$\text{Mass CO} = \left( \frac{M_{ex}}{C_w} \right) \left( \frac{CO}{100} \right) \left( \frac{MW_{CO}}{MW_{ex}} \right) 453.59237,$$

where  $MW_{CO}$  = molecular weight of CO (=28.01115),

$MW_{ex}$  = molecular weight of exhaust gas (=28.967),

$$C_w = \text{correction for water removal} = 1 + \frac{\left( \frac{x}{2} \right) (CO + CO_2) - H_2}{100}$$

$$\text{Mass HC} = 0.0002207 (F) (A/F + 1) (HC),$$

$$\text{Mass NO}_x = 0.0007201 (F) (A/F + 1) (NO_x) \left[ \frac{1}{1 + 0.03148(CO_2)} \left( \frac{CO + CO_2}{CO + 3CO_2} \right) \right] (K_H),$$

where  $K_H$  is the humidity correction factor (dimensionless).

$$K_H = \frac{1}{1 - 0.0047 (H - 75)},$$

where A/F = air-fuel ratio

B = barometric pressure, mm Hg

CO = carbon monoxide concentration, pct, vol

$CO_2$  = carbon dioxide concentration, pct, vol

D = intake air dew point, °F

F = fuel rate, lb/hr

H = humidity, grains  $H_2O/1b$  dry air

HC = unburned hydrocarbon concentration, ppmC; vol

$K_H$  = humidity correction factor

N = engine speed, rpm

$NO_x$  = nitrogen oxides concentration, ppm, vol

$O_2$  = oxygen concentration, pct, vol

P = corrected power, brake horsepower

t = intake air temperature, °F

T = torque, ft-lb

W = water vapor pressure, mm Hg.

### 3. DISCUSSION OF TEST RESULTS

Engine performance at wide-open-throttle (WOT) showed that the peak torque and brake horsepower values produced by the test engine (figure 1) were slightly in excess of those figures quoted in table 1. The brake specific fuel consumption at WOT showed some variability, possibly due to slight fuel metering inaccuracy. Air-fuel ratio was found to be repeatable over the entire operating range of the engine (figure 2). The values for air-fuel ratio, however, do not reflect the actual stoichiometry in the combustion chamber due to the influence of the air-injection system. Fuel consumption rates at engine speeds below 2,600 rpm show a typical dependence on power output (figure 3). At engine speed above 2,600 rpm and above power output levels of 75 pct of full load the rate of change of fuel consumption with power output becomes smaller. Emissions of HC and CO were maintained at low levels except near WOT conditions and also near no-load conditions for some engine speeds (figures 4 and 5). Maximum levels of NO<sub>x</sub> emissions occur typically at 90 to 100 pct of full load for each engine speed (figure 6).

The repeatability of emission rates, fuel consumption, and performance data are satisfactory for the purposes of this test.

#### 4. CONCLUSIONS

The purpose of the experimental work here is to establish data for this engine. Those data are presented in the tables accompanying this report.

TABLE 1. GENERAL ENGINE SPECIFICATIONS

---

Displacement.....	400 cu. in.
Maximum brake horsepower*.....	165 hp @ 3,500 rpm
Maximum torque*.....	329 ft-lb @ 1,800 rpm
Bore and stroke.....	4.00 in. x 4.00 in.
Configuration.....	90° V 8 cylinders
Compression ratio.....	8.0
Firing order.....	1-3-7-2-6-5-4-8
Ignition timing at idle speed**.....	12° BTC @ 650 rpm
Block material.....	Cast iron
Head material.....	Cast iron
Number of crankshaft mainbearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive.....	Chain
 Valve lift:	
Intake.....	0.428 in.
Exhaust.....	0.433 in.
Valve port size:	
Intake.....	2.04 in.
Exhaust.....	1.65 in.
Valve timing:	
Intake, opens.....	17° BTC
Intake, closes.....	59° ABC
Exhaust, opens.....	65° BBC
Exhaust, closes.....	27° ATC
Spark plug gap.....	0.044 in.
Distributor specifications:	
Centrifugal advance begins <sup>+</sup> .....	1° @ 500 rpm
Centrifugal advance, intermediate <sup>+</sup> ..	4.5° @ 650 rpm
Centrifugal advance, intermediate <sup>+</sup> ..	8.375° @ 1,500 rpm
Centrifugal advance, full <sup>+</sup> .....	14° @ 2,500 rpm
Vacuum advance, begins <sup>+</sup> .....	0° @ 3 in. Hg
Vacuum advance, maximum <sup>+</sup> .....	15-1/2 @ 11-1/2 in. Hg
Exhaust gas recirculation system:	
Valve type.....	Tapered stem
Control signal.....	Manifold and venturi vacuum
Point of discharge.....	EGR spacer
Crankcase emission control:	
Control method.....	Positive crankcase ventilation
Point of discharge.....	Air cleaner
Carburetor type.....	2V downdraft

---

\* Average estimated net (SAE J-245).

\*\*Vacuum advance disconnected and plugged.

+ Distributor degrees at distributor rpm.

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated Vehicle Speed, mph	Engine Speed, rpm	Manifold Vacuum, in. Hg	Fraction of Time in Mode
0	550	17.75	1/10
20	900	19.5	"
30	1,150	16.5	"
40	1,550	16	"
50	1,900	14.25	"
60	2,250	12.25	"
25	1,050	17.75	"
35	1,400	16.25	"
45	1,700	16	"
55	2,100	12.75	"

Mileage per cycle = 90 miles.

Total mileage accumulated over the 45-hour break-in period = 1,620 miles.

TABLE 3. FUEL SPECIFICATIONS

Fuel No.....	7602
Research octane No.....	91.5
Motor octane No.....	83.8
Reid vapor pressure, psig.....	11.9
Distillation, °F:	
10 pct.....	134
50 pct.....	214
95 pct.....	388
100 pct.....	418
API gravity, deg.....	67.0
FIA analysis, pct:	
Aromatics.....	11
Olefins.....	16
Paraffins.....	73
Sulfur, pct.....	0.024
Lead, g/gal.....	Trace
Hydrogen/carbon atomic ratio.....	2.09
Specific gravity.....	0.7126

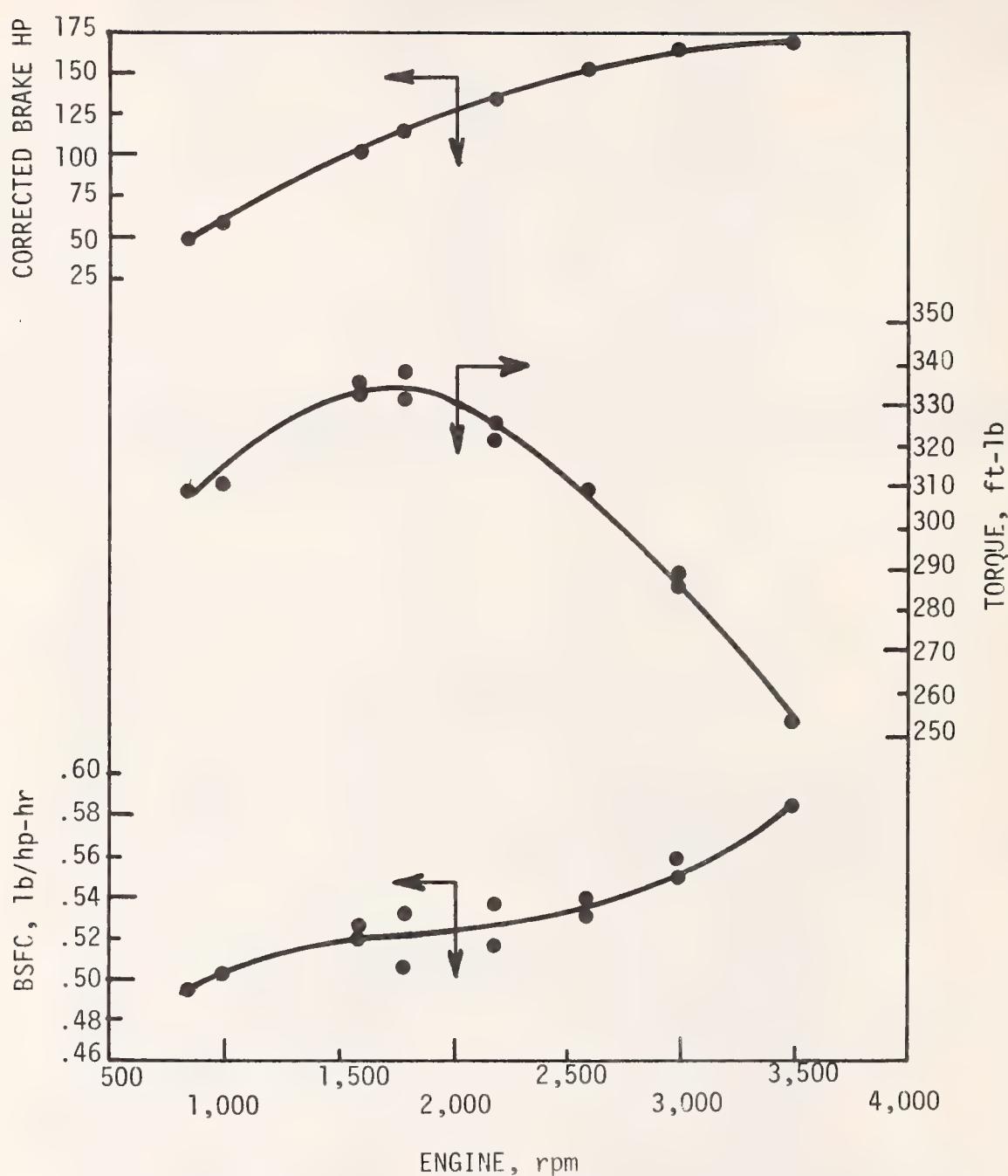


FIGURE 1. Brake Specific Fuel Consumption, Torque and Brake Horsepower versus Engine rpm at Wide-Open-Throttle--400-CID Ford Engine.

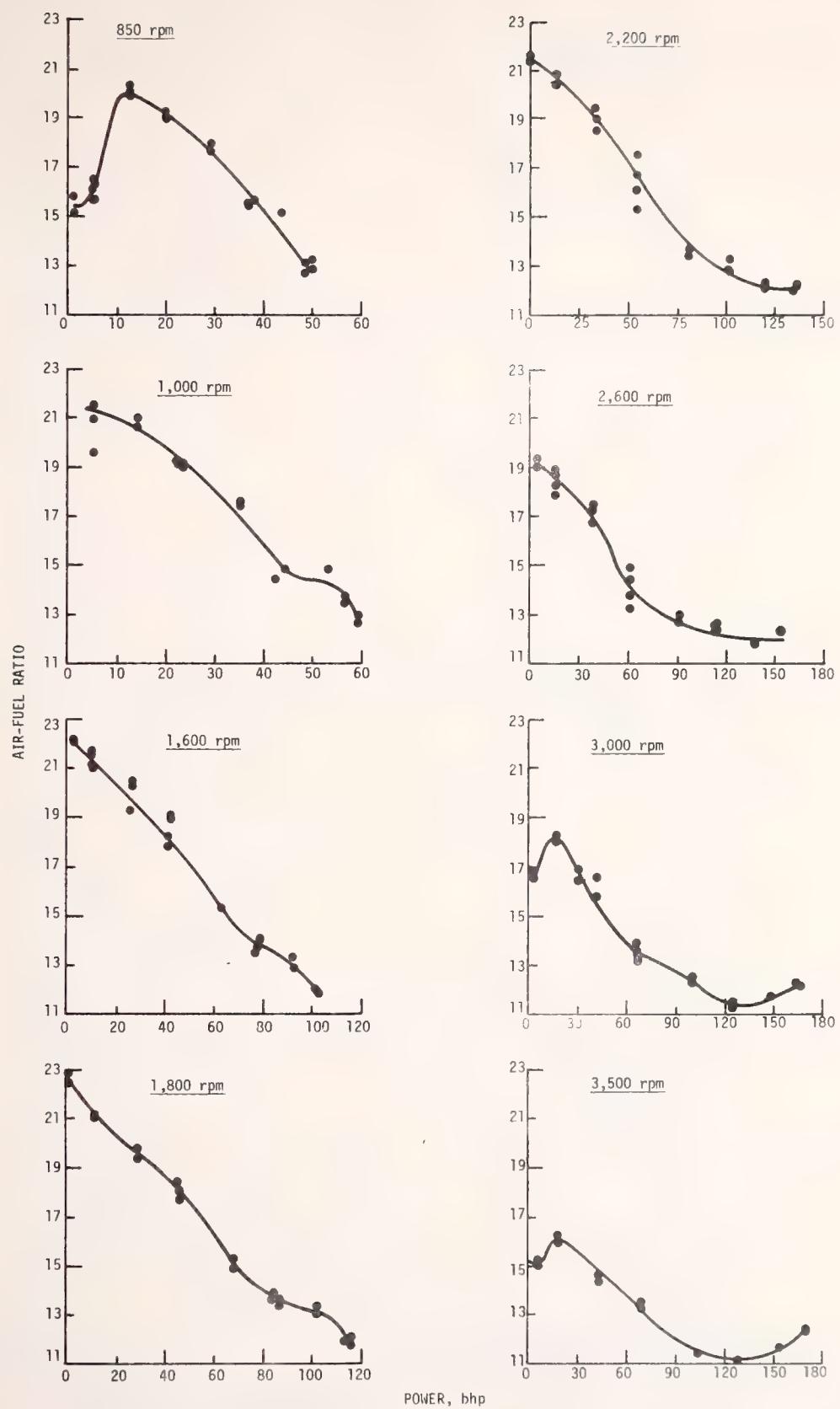


FIGURE 2. Air/Fuel Ratio versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

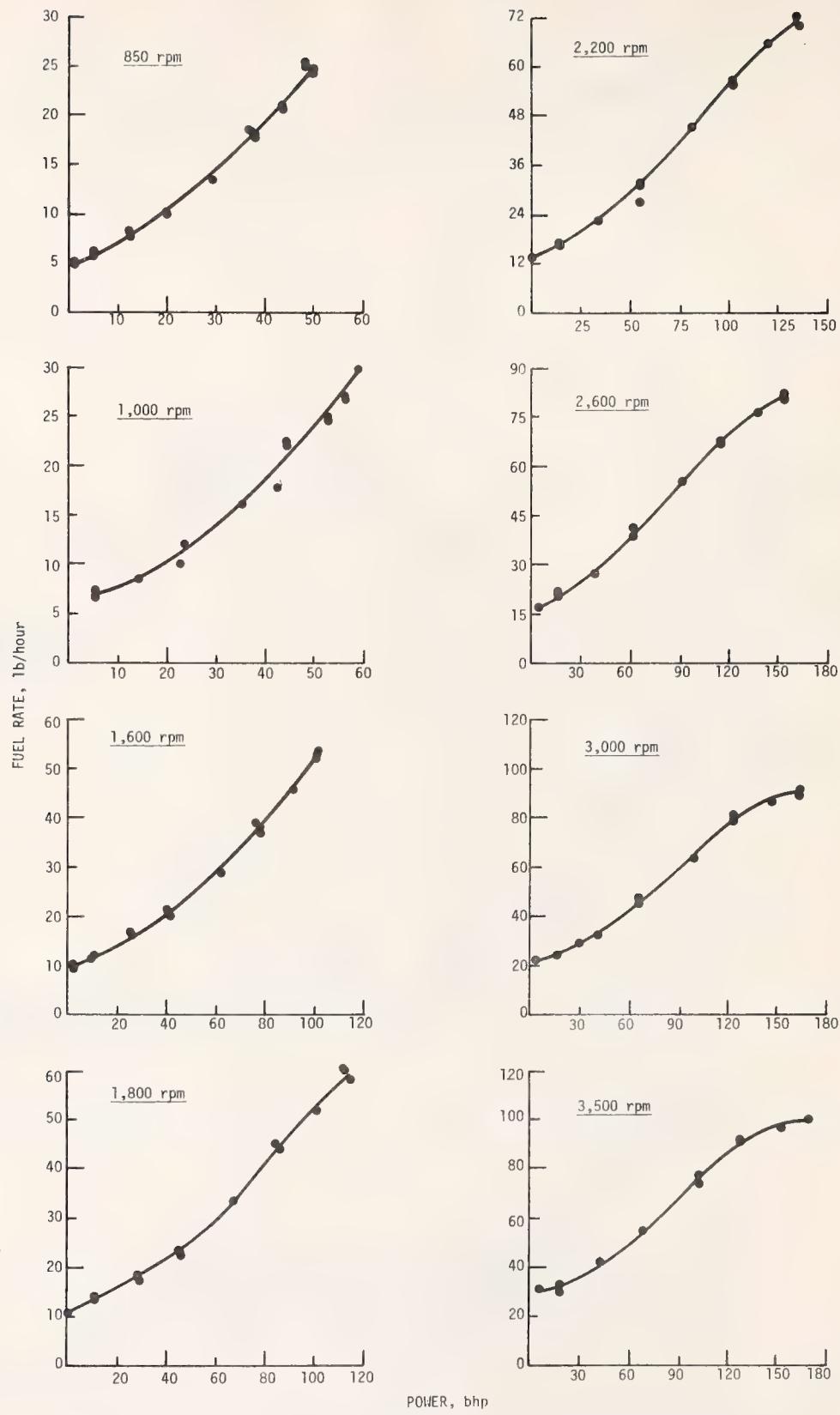


FIGURE 3. Fuel Rate versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

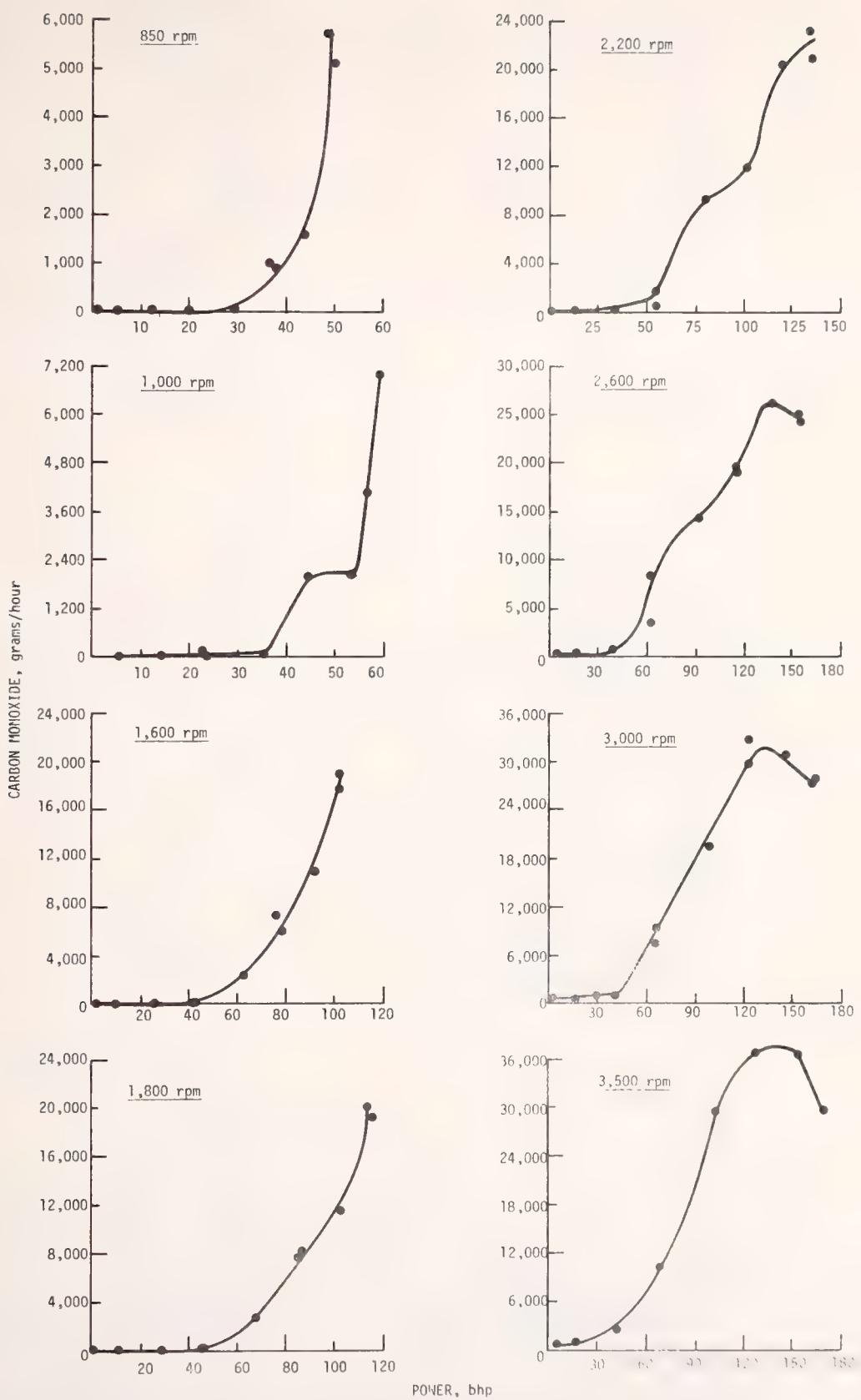


FIGURE 4. Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

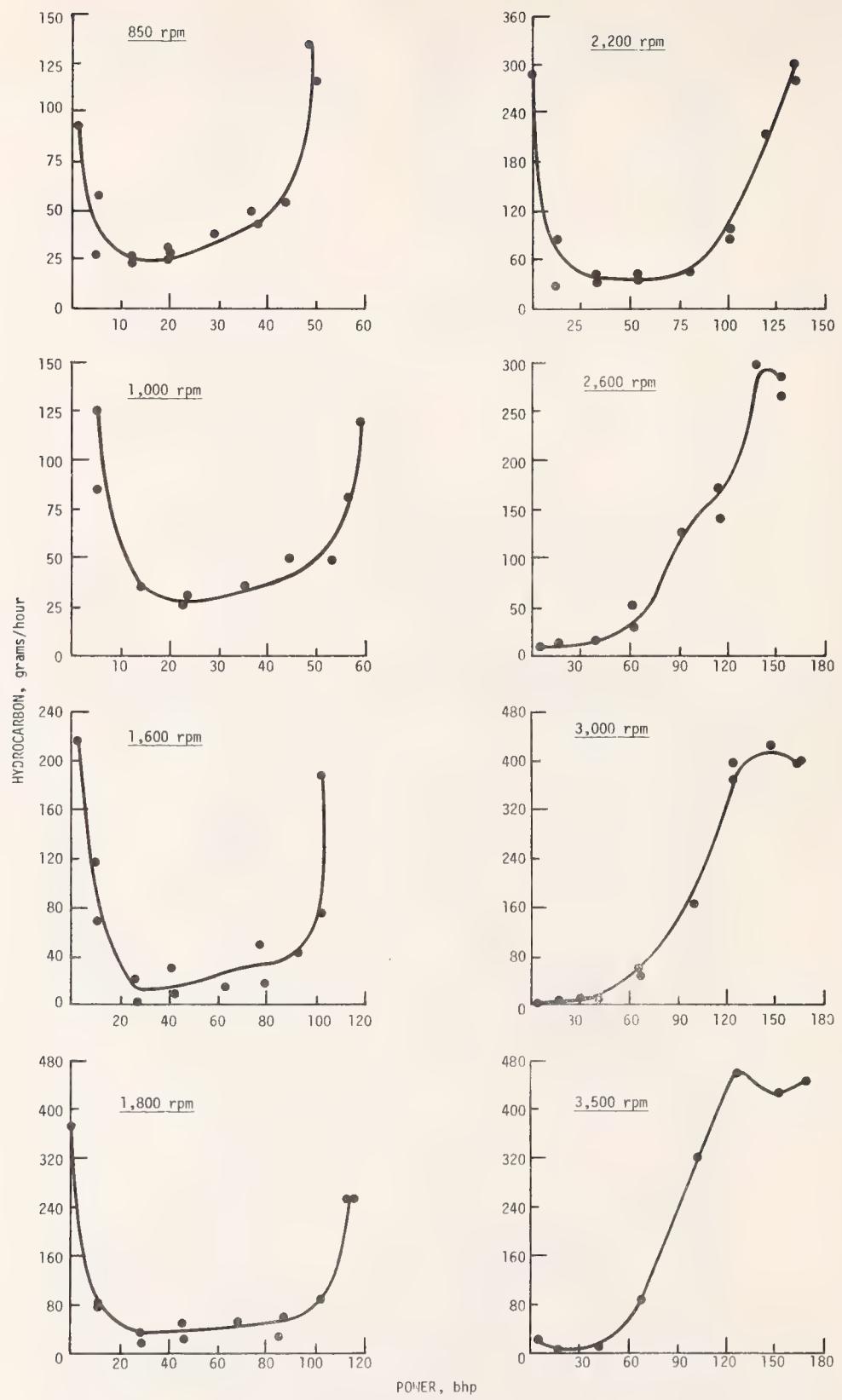


FIGURE 5. Hydrocarbon Emissions versus Power at Various Speed and Load Conditions--400 CID Ford Engine.

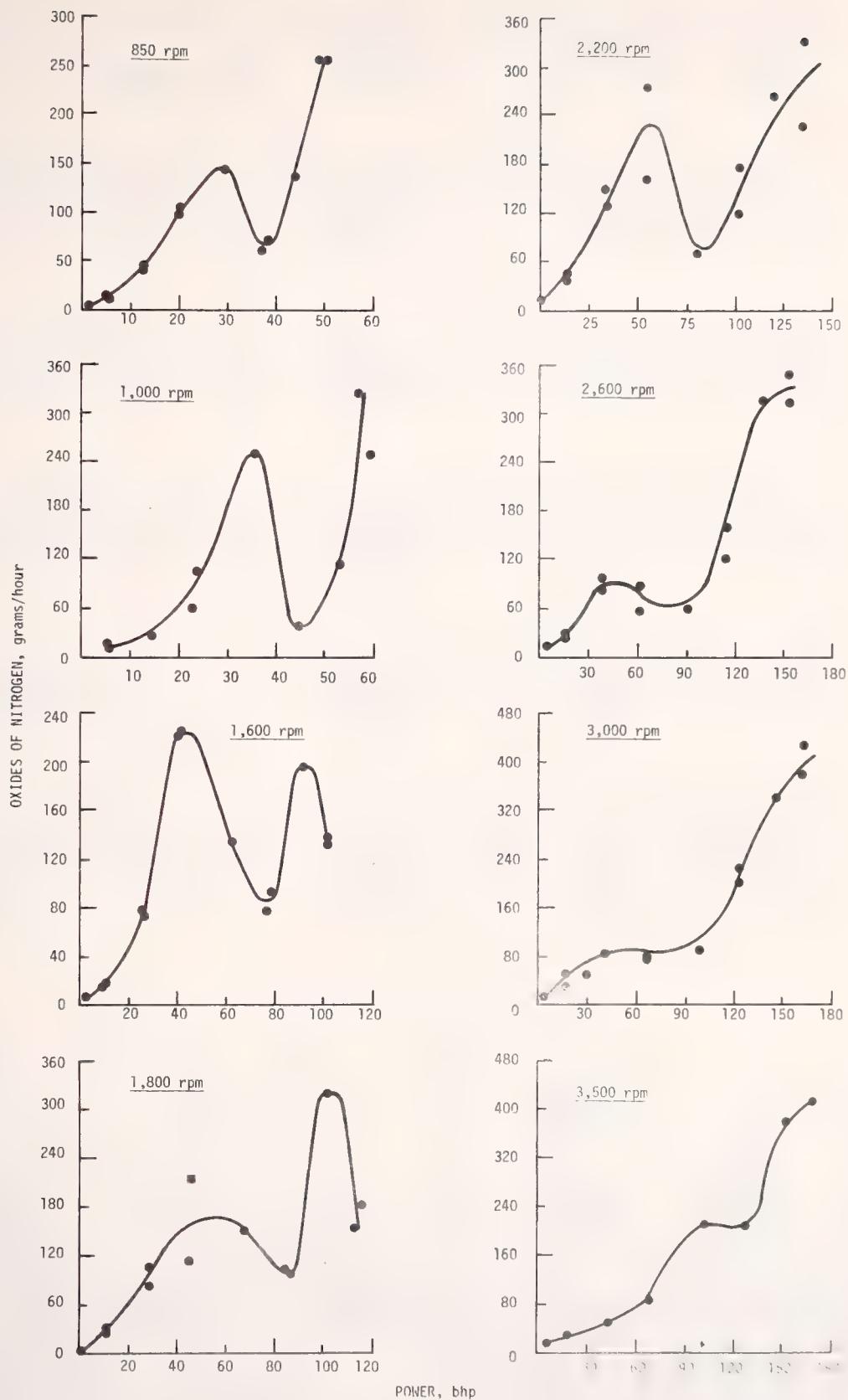


FIGURE 6. Oxides of Nitrogen Emissions versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

	1.1	1.2	2.1	2.2	3.1	3.2
6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
744.3	744.3	744.3	744.3	744.3	744.3	744.3
59	59	59	59	59	59	59
92	92	92	82	82	82	82
650	650	650	650	650	650	650
.5	.5	10.0	10.0	20.0	20.0	20.0
.1	.1	1.2	1.2	2.5	2.5	2.5
3.6	3.6	4.2	4.2	4.1	4.1	4.2
39.0	39.0	38.0	38.0	38.0	38.0	38.0
20.0	20.0	20.0	20.0	19.5	19.5	19.5
1.0	1.0	1.0	1.0	1.0	1.0	1.0
157	157	123	123	121	121	121

CONCENTRATIONS, DRY BASIS						
CO, %	7.000	20.1	7.000	1.671	5.250	1.420
CO2, %	11.11	12.25	12.13	12.75	12.75	12.87
O2, %	4.40	3.00	2.70	2.25	1.80	1.80
HC, PPM	28022	11295	18670	8508	11368	5677
NOX, PPM	18	15	35	25	65	40
AIR/FUEL RATIO	14.65	15.71	14.47	15.48	14.69	15.49

EMISSION RATES, G/HR						
CO	153.6	46.7	176.5	45.0	129.1	38.2
HC	309.9	132.3	237.2	115.5	140.9	77.0
NOX+	.6	.5	1.4	1.0	2.5	1.7

OIL TEMPERATURE, F	186	186	182	182	184	184
OIL PRESSURE, PSI	26	26	27	27	27	27
COOLANT TEMPERATURE, F	187	187	187	187	183	183
EXHAUST PRESSURE, IN. H2O	13.0	27.0	20.0	20.0	1.0	1.0
EXHAUST TEMPERATURE, F	361	516	377	377	501	471

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	4.1	4.2	5.1	5.2	6.1	6.2
TEST DATE	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
BAROMETER, MMHG	744.3	744.3	744.3	744.3	744.3	744.3
HUMIDITY, GRAINS/LB	59	59	59	59	59	59
TEMPERATURE, F	82	82	82	82	82	82
ENGINE SPEED, RPM	750	750	750	750	750	750
TORQUE, FT-LB	.2	.2	10.2	10.2	20.0	20.0
POWER, BHP*	0	0	1.5	1.5	2.9	2.9
FUEL RATE, LB/HR	4.1	4.2	4.2	4.3	4.5	4.7
IGNITION TIMING, DEG BTDC	38.0	38.0	37.0	37.0	38.5	38.5
MANIFOLD VACUUM, IN HG	20.5	20.5	20.5	20.5	20.0	20.0
THROTTLE ANGLE, DEG	0	0	0	0	1.0	1.0
INTAKE MAN. TEMP., F	122	122	121	121	153	153
CONCENTRATIONS, DRY BASIS						
CO, %	108.2	188.2	700.0	2380	5669	1890
CO2, %	12.37	12.37	12.50	12.87	12.88	13.01
O2, %	2.60	2.60	2.00	1.90	1.75	1.92
HC, PPM	11306	11306	14193	6817	8539	4549
NOX, PPM	17	17	46	27	85	78
AIR/FUEL RATIO	15.42	15.42	14.46	15.38	14.93	15.67
EMISSION RATES, G/HR						
CO	49.1	50.3	177.4	64.5	157.6	57.3
HC	148.6	152.2	181.3	93.1	119.8	69.5
NOX+	7	7	1.8	1.1	3.6	3.6
OIL TEMPERATURE, F	185	185	186	186	189	189
OIL PRESSURE, PSI	30	30	29	29	29	29
COOLANT TEMPERATURE, F	181	181	184	184	187	187
EXHAUST PRESSURE, IN. H2O	5.0	2.0	5.0	2.0	0	0
EXHAUST TEMPERATURE, F	386	522	405	516	472	565

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

	7.1	7.2	8.1	8.2	9.1	9.2
	5/25/76	5/25/76	5/25/76	5/25/76	5/25/76	5/25/76
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	57	57	57	57	57	57
TEMPERATURE, F	76	76	77	77	78	78
ENGINE SPEED, RPM	850	850	850	850	850	850
TORQUE, FT-LB	300.0	300.0	270.0	270.0	226.0	226.0
POWER, BHP*	48.4	48.4	43.6	43.6	36.6	36.6
FUEL RATE, LB/HR	25.0	25.4	21.0	20.7	18.3	18.6
IGNITION TIMING, DEG BTDC	13.5	13.5	13.5	13.5	13.5	13.5
MANIFOLD VACUUM, IN HG	0.0	0.0	2.0	2.0	2.5	2.5
THROTTLE ANGLE, DEG	79.0	79.0	27.0	27.0	23.0	23.0
INTAKE MAN. TEMP., F	88	88	112	112	149	149
<hr/>						
CONCENTRATIONS, DRY BASIS						
CO, %	4.8900	4.1800	2.0600	1.2400	1.5200	8495
CO2, %	11.21	11.55	11.78	12.88	12.13	12.75
O2, %	11.12	11.35	12.05	11.45	12.20	11.85
HC, PPM	1892	1949	1364	834	1336	826
NOX, PPM	940	1235	1000	700	400	335
<hr/>						
AIR/FUEL RATIO	12.70	13.13	15.21	15.23	15.57	15.71
<hr/>						
EMISSION RATES, G/HR						
CO	6399.7	5735.6	2711.7	1602.5	1781.3	1018.0
HC	124.8	134.8	90.5	54.3	78.9	49.9
NOX+	186.5	257.0	199.6	137.2	71.1	60.9
<hr/>						
OIL TEMPERATURE, F	213	213	208	208	206	206
OIL PRESSURE, PSI	25	25	26	26	28	28
COOLANT TEMPERATURE, F	166	166	167	167	185	185
EXHAUST PRESSURE, IN. H2O	22.0	15.0	24.0	14.0	11.0	11.0
EXHAUST TEMPERATURE, F	695	836	723	996	727	946

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE:	7602
TEST NUMBER	10.1
TEST DATE	5/25/76
BAROMETER, MMHG	742.0
HUMIDITY, GRAINS/LB	57
TEMPERATURE, F	79
ENGINE SPEED, RPM	850
TORQUE, FT-LB	180.0
POWER, BHP*	29.1
FUEL RATE, LB/HR	13.4
IGNITION TIMING, DEG BTDC	30.0
MANIFOLD VACUUM, IN HG	7.0
THROTTLE ANGLE, DEG	12.5
INTAKE MAN. TEMP., F	154

CONCENTRATIONS, DRY BASIS

CO, %	11.80
CO <sub>2</sub> , %	12.02
O <sub>2</sub> , %	3.75
HC, PPM	1166
NO <sub>x</sub> , PPM	1075

AIR/FUEL RATIO

AIR/FUEL RATIO	17.71
	17.98
	19.32
	19.11
	20.34
	19.87

EMISSION RATES, G/HR

CO	115.5
HC	57.5
NO <sub>x</sub> +	159.6

OIL TEMPERATURE, F	204
OIL PRESSURE, PSI	28
COOLANT TEMPERATURE, F	195
EXHAUST PRESSURE, IN. H2O	13.0
EXHAUST TEMPERATURE, F	625
	752
	505
	636
	508

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	13.1	13.2	14.1	14.2	15.1	15.2
TEST DATE	5/25/76	5/25/76	5/25/76	5/25/76	6/ 9/76	6/ 9/76
BAROMETER, MMHG	742.0	742.0	742.0	742.0	744.3	744.3
HUMIDITY, GRAINS/LB	57	57	57	57	59	59
TEMPERATURE, F	79	79	79	79	82	82
ENGINE SPEED, RPM	850	850	850	850	1000	1000
TORQUE, FT-LB	30.0	30.0	7.8	7.8	310.0	310.0
POWER, BHP*	4.9	4.9	1.3	1.3	59.1	59.1
FUEL RATE, LB/HR	5.9	5.8	4.9	5.0	29.7	29.6
IGNITION TIMING, DEG BTDC	42.0	42.0	41.0	41.0	18.5	18.5
MANIFOLD VACUUM, IN HG	19.5	19.5	20.5	20.5	0	0
THROTTLE ANGLE, DEG	4.0	4.0	3.0	3.0	78.5	78.5
INTAKE MAN. TEMP., F	118	118	118	118	91	91
CONCENTRATIONS, DRY BASIS						
CO, %	2.205	0.940	4180	1890	4.8900	4.3800
CO2, %	13.27	13.40	12.26	13.27	11.11	11.33
O2, %	2.15	2.00	3.25	2.25	.07	.18
HC, PPM	5701	1426	16965	5700	1633	1489
NOX, PPM	250	245	80	105	900	1025
AIR/FUEL RATIO	15.68	16.12	15.15	15.76	12.68	12.96
EMISSION RATES, G/HR						
CO	84.0	36.0	127.6	61.3	7608.6	6920.2
HC	109.5	27.5	261.0	93.2	128.0	118.6
NOX+	14.4	14.2	3.7	5.2	214.8	248.4
OIL TEMPERATURE, F	198	198	195	195	214	214
OIL PRESSURE, PSI	30	30	32	32	27	27
COOLANT TEMPERATURE, F	181	181	188	188	195	195
EXHAUST PRESSURE, IN. H2O	1.0	0	1.0	0	27.0	16.0
EXHAUST TEMPERATURE, F	475	575	427	599	729	852

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	16.1	16.2	17.1	17.2	18.1
TEST DATE	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
BAROMETER, MMHG	744.3	744.3	744.3	744.3	744.3
HUMIDITY, GRAINS/LB	59	59	59	59	59
TEMPERATURE, F	82	82	82	82	83
ENGINE SPEED, RPM	1000	1000	1000	1000	1000
TORQUE, FT-LB	279.0	279.0	233.0	233.0	185.0
POWER, BHP*	53.1	53.1	44.4	44.4	35.3
FUEL RATE, LB/HR	24.6	24.2	22.1	21.8	15.7
IGNITION TIMING, DEG BTDC	18.5	18.5	20.0	20.0	38.5
MANIFOLD VACUUM, IN HG	2.0	2.0	2.8	2.8	7.5
THROTTLE ANGLE, DEG	29.0	29.0	23.0	23.0	13.0
INTAKE MAN. TEMP., F	120	120	161	161	161
<hr/>					
CONCENTRATIONS, DRY BASIS					
CO, %	2.3300	1.3500	2.6600	1.4800	.0700
CO2, %	11.78	12.88	11.55	12.75	12.26
O2, %	1.67	1.00	1.99	1.05	3.47
HC, PPM/C	1024	658	1280	743	621
NOX, PPH	680	500	225	180	1400
AIR/FUEL RATIO	14.83	14.88	14.85	14.83	17.41
<hr/>					
EMISSION RATES, G/HR					
CO	3494.0	1993.8	3586.5	1962.7	126.0
HC	77.4	48.9	87.0	49.7	60.5
NOX+	156.4	113.3	46.5	36.6	240.5
OIL TEMPERATURE, F	212	212	206	206	205
OIL PRESSURE, PSI	28	28	28	28	30
COOLANT TEMPERATURE, F	185	185	178	178	189
EXHAUST PRESSURE, IN. H2O	27.0	17.0	22.0	12.0	8.0
EXHAUST TEMPERATURE, F	772	1032	734	1001	641
<hr/>					

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE : FORD 400 CID

FUEL CODE : 7602

TEST NUMBER

TEST DATE	6 / 9 / 76	6 / 9 / 76	5 / 27 / 76	5 / 27 / 76	5 / 27 / 76	6 / 17 / 76	6 / 17 / 76	21.1	21.2	21.1	23.1	23.2
BAROMETER, MMHG	744.3	744.3	745.4	745.4	745.4	740.6	740.6					
HUMIDITY, GRAINS/LB	59	59	63	63	63	62	62					
TEMPERATURE, F	83	83	77	77	77	81	81					
ENGINE SPEED, RPM	1000	1000	1000	1000	1000	1600	1600					
TORQUE, FT-LB	124.0	124.0	28.4	28.4	28.4	333.0	333.0					
POWER, BHP*	23.6	23.6	5.4	5.4	5.4	102.0	102.0					
FUEL RATE, LB/HR	11.8	11.8	6.8	6.8	7.0	53.6	53.6					
IGNITION TIMING, DEG BTDC	45.0	45.0	40.0	40.0	40.0	24.0	24.0					
MANIFOLD VACUUM, IN HG	12.0	12.0	19.0	19.0	19.0	0	0					
THROTTLE ANGLE, DEG	9.0	9.0	4.5	4.5	7.9	79.0	79.0					
INTAKE MAN. TEMP., F	157	157	130	130	88							
CONCENTRATIONS, DRY BASIS												
CO, %	0.561	0.332	7380	6607	73900	7.1900	7.1900					
CO2, %	11.22	11.33	10.19	10.19	9.89	9.89	9.89					
O2, %	4.95	4.80	6.50	7.00	0.6	0.6	0.6					
HC, PPHC	1146	671	3890	2767	572	572	572					
NOX, PPM	920	730	93	167	325	325	325					
AIR/FUEL RATIO	18.99	18.91	19.55	20.96	11.79	11.79	11.79					
EMISSION RATES, G/HR												
CO	52.1	30.7	404.3	37.1	19397.5	18959.9	18959.9					
HC	53.6	31.3	107.4	65.2	75.7	76.0	76.0					
NOX+	131.0	103.6	7.9	15.9	132.1	130.6	130.6					
OIL TEMPERATURE, F	202	202	206	206	230	230	230					
OIL PRESSURE, PSI	32	32	32	30	33	33	33					
COOLANT TEMPERATURE, F	175	175	175	186	196	196	196					
EXHAUST PRESSURE, IN. H2O	11.0	5.0	5.0	3.0	69.0	48.0	48.0					
EXHAUST TEMPERATURE, F	598	704	513	672	864	1032	1032					

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	24.1	24.2	25.1	25.2	26.1	26.2
TEST DATE	6/17/76	6/17/76	6/15/76	6/15/76	6/15/76	6/15/76
BAROMETER, MMHG	740.6	740.6	742.1	742.1	742.1	742.1
HUMIDITY, GRAINS/LB	62	62	60	60	60	60
TEMPERATURE, F	82	82	81	81	84	84
ENGINE SPEED, RPM	1600	1600	1600	1600	1600	1600
TORQUE, FT-LB	300.0	300.0	257.0	257.0	205.0	205.0
POWER, BHP*	91.9	91.9	78.5	78.5	62.8	62.8
FUEL RATE, LB/HR	45.9	45.8	37.0	38.1	29.0	28.7
IGNITION TIMING, DEG BTDC	22.0	22.0	25.0	25.0	39.0	39.0
MANIFOLD VACUUM, IN HG	1.5	1.5	3.0	3.0	6.5	6.5
THROTTLE ANGLE, DEG	43.0	43.0	33.0	33.0	23.5	23.5
INTAKE MAN. TEMP., F	107	107	162	162	194	194
CONCENTRATIONS, DRY BASIS						
CO, %	5.7700	4.3700	3.8600	2.7800	2.6200	1.3100
CO2, %	10.09	11.32	10.90	11.89	11.00	11.237
O2, %	1.00	.53	1.35	.65	2.45	1.45
HC, PPMC	1025	344	410	171	764	171
NOX, PPM	470	500	320	270	570	480
AIR/FUEL RATIO	12.83	13.26	13.93	14.01	15.26	15.27
EMISSION RATES, G/HR						
CO	4100.4	10923.2	8228.9	6111.3	4787.4	2358.5
HC	126.3	43.3	44.0	19.0	70.4	15.5
HOX+	177.8	193.5	104.7	91.1	159.9	132.7
OIL TEMPERATURE, F	234	234	234	234	231	231
OIL PRESSURE, PSI	35	35	35	35	36	36
COOLANT TEMPERATURE, F	191	191	192	192	189	189
EXHAUST PRESSURE, IN. H2O	63.0	50.0	58.0	38.0	25.0	25.0
EXHAUST TEMPERATURE, F	892	1224	882	1215	767	1106

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE	27.1	27.2	28.1	28.2	29.1
BAROMETER, MMHG	6/15/76	6/15/76	6/15/76	6/15/76	6/11/76
HUMIDITY, GRAINS/LB	742.1	742.1	742.1	742.1	737.7
TEMPERATURE, F	60	60	60	60	67
ENGINE SPEED, RPM	81	81	82	82	84
TORQUE, FT-LB	1600	1600	1600	1600	1600
POWER, BHP*	137.0	137.0	86.0	86.0	31.2
FUEL RATE, LB/HR	41.8	41.8	26.3	26.3	9.6
IGNITION TIMING, DEG BTDC	19.8	20.3	16.4	16.1	11.2
MANIFOLD VACUUM, IN HG	50.0	50.0	48.0	48.0	51.0
THROTTLE ANGLE, DEG	11.0	11.0	14.0	14.0	16.5
INTAKE MAN. TEMP., F	16.0	16.0	12.0	12.0	7.5
	188	188	181	181	162
CONCENTRATIONS, DRY BASIS					
CO, %	0.607	0.378	0.772	0.424	.0748
CO2, %	11.11	11.00	10.28	10.50	9.31
O2, %	4.65	4.70	5.95	5.80	7.50
HC, PPM	536	112	122	44	3844
NOX, PPM	1025	912	375	355	88
AIR/FUEL RATIO	18.87	19.04	20.44	20.24	21.46
EMISSION RATES, G/HR					
CO	93.7	60.5	107.3	57.2	145.2
HC	41.7	9.0	8.5	3.0	198.1
NOX+	243.0	224.0	80.0	73.5	14.2
OIL TEMPERATURE, F	218	218	212	212	195
OIL PRESSURE, PSI	40	40	45	45	53
COOLANT TEMPERATURE, F	190	190	184	184	178
EXHAUST PRESSURE, IN. H2O	27.0	15.0	22.0	22.0	13.0
EXHAUST TEMPERATURE, F	702	686	675	675	625

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	30.1	30.2	31.1	31.2	32.1
TEST DATE	6/11/76	6/11/76	5/27/76	5/27/76	5/27/76
BARDMETER, MMHG	737.7	737.7	745.4	745.4	745.4
HUMIDITY, GRAINS/LB	67	67	63	63	63
TEMPERATURE, F	84	84	77	77	77
ENGINE SPEED, RPM	1600	1600	1800	1800	1800
TORQUE, FT-LB	8.0	8.0	332.0	332.0	299.0
POWER, BHP*	2.5	2.5	113.3	113.3	102.0
FUEL RATE, LB/HR	10.1	9.6	60.1	60.5	52.4
IGNITION TIMING, DEG BTDC	50.0	50.0	25.0	25.0	25.0
MANIFOLD VACUUM, IN HG	19.6	19.6	.2	.2	1.8
THROTTLE ANGLE, DEG	6.5	6.5	79.0	79.0	35.5
INTAKE MAN. TEMP., F	154	154	87	87	98
CONCENTRATIONS, DRY BASIS					
CO, %	.1603	.0880	6.7900	6.6800	5.3700
CO2, %	8.46	9.07	9.89	10.09	10.50
O2, %	8.75	7.87	.08	.07	.90
HC, PPM	9806	4820	1770	1658	1142
NOX, PPM	35	47	355	330	750
AIR/FUEL RATIO	22.16	22.07	11.87	11.94	12.97
EMISSION RATES, G/HR					
CO	151.6	78.3	20175.0	20081.4	15104.3
HC	467.4	216.0	265.0	251.2	161.8
HOX+	5.2	6.6	164.1	154.3	328.2
OIL TEMPERATURE, F	189	189	243	243	248
OIL PRESSURE, PSI	55	55	35	35	35
COOLANT TEMPERATURE, F	172	172	195	195	196
EXHAUST PRESSURE, IN. H2O	11.0	5.0	94.0	71.0	96.0
EXHAUST TEMPERATURE, F	584	791	859	1085	928

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

**ENGINE: FORD 400 CID**

**FUEL CODE: 7602**

TEST NUMBER	TEST DATE	33.1	33.2	34.1	34.2	35.1	35.2
BAROMETER, MMHG	745.4	745.4	745.4	745.4	745.4	745.4	745.4
HUMIDITY, GRAINS/LB	63	63	63	63	63	63	63
TEMPERATURE, F	77	77	78	78	79	79	79
ENGINE SPEED, RPM	1800	1800	1800	1800	1800	1800	1800
TORQUE, FT-LB	249.0	249.0	199.0	199.0	133.0	133.0	133.0
POWER, BHP*	84.9	84.9	67.9	67.9	45.4	45.4	45.4
FUEL RATE, LB/HR	45.1	45.3	33.7	34.1	22.9	22.9	23.5
IGNITION TIMING, DEG BTDC	26.0	26.0	40.0	40.0	52.0	52.0	52.0
MANIFOLD VACUUM, IN HG	3.2	3.2	6.3	6.3	10.7	10.7	10.7
THROTTLE ANGLE, DEG	28.0	28.0	20.0	20.0	14.0	14.0	14.0
INTAKE MAN. TEMP., F	151	151	195	195	197	197	197
CONCENTRATIONS, DRY BASIS							
CO, %	4.6300	2.9600	2.7500	1.2400	1.826	1.892	1.892
CO <sub>2</sub> , %	10.60	12.26	11.33	12.84	11.78	11.63	11.63
O <sub>2</sub> , %	1.32	.50	2.10	1.50	4.04	4.38	4.38
HC, PPM	205	218	1034	503	871	572	572
NOX, PPM	295	255	515	455	1175	415	415
AIR/FUEL RATIO	13.59	13.86	14.91	15.29	18.00	18.41	18.41
EMISSION RATES, G/HR							
CO	11724.7	7623.7	5691.4	2642.2	310.6	150.7	150.7
HC	26.2	28.3	107.8	54.0	74.7	51.3	51.3
NOX+	116.2	102.2	165.8	150.8	310.9	114.9	114.9
OIL TEMPERATURE, F	242	242	239	239	234	234	234
OIL PRESSURE, PSI	36	36	37	37	40	40	40
COOLANT TEMPERATURE, F	196	196	195	195	195	195	195
EXHAUST PRESSURE, IN. H2O	80.0	57.0	52.0	36.0	33.0	21.0	21.0
EXHAUST TEMPERATURE, F	916	1298	810	1173	743	954	954

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

INTAKE AIR TEMP., F

INTAKE AIR FUEL RATIO

CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %O<sub>2</sub>, %

HC, PPM

NO<sub>x</sub>, PPM

AIR/FUEL RATIO

36.1	36.2	37.1	37.2	38.1	38.2
5/27/76	5/27/76	5/28/76	5/28/76	6/10/76	6/10/76
745.4	745.4	745.0	745.0	742.5	742.5
63	63	63	63	64	64
78	78	77	77	84	84
1800	1800	1800	1800	1800	1800
84.0	84.0	34.0	34.0	3.0	3.0
28.7	28.7	11.6	11.6	1.0	1.0
18.2	18.3	13.6	13.6	11.1	11.1
52.0	52.0	49.0	49.0	52.0	52.0
14.0	14.0	17.0	17.0	19.7	19.7
11.0	11.0	9.0	9.0	8.0	8.0
189	189	152	152	160	160
.0470	.0470	.1325	.0772	.0092	.0092
10.74	10.86	9.70	9.89	8.10	8.64
5.65	5.60	7.00	6.75	9.00	8.50
946	490	2205	1380	9229	7091
510	460	160	170	15	41
19.77	19.80	21.28	21.17	22.84	22.51

EMISSION RATES, G/HR				
CO	139.8	70.4	160.3	94.9
HC	70.9	37.0	134.4	85.5
NO <sub>x</sub> +	118.0	107.2	30.1	32.5

OIL TEMPERATURE, F	226	226	217	210
OIL PRESSURE, PSI	43	43	46	50
COLANT TEMPERATURE, F	193	193	189	188
EXHAUST PRESSURE, IN. H2O	22.0	15.0	16.0	13.0
EXHAUST TEMPERATURE, F	703	905	629	602

\* CORRECTED SAE J816B  
 + CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE	5/28/76	39.1	39.2	39.1	40.1	40.2	40.1	41.1	41.2
BAROMETER, MMHG	745.0	745.0	745.0	745.0	745.0	745.0	745.0	745.0	745.0
HUMIDITY, GRAINS/LB	63	63	63	63	63	63	63	63	63
TEMPERATURE, F	77	77	77	77	77	77	77	77	77
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	322.0	322.0	322.0	322.0	322.0	322.0	322.0	322.0	322.0
POWER, BHP*	134.3	134.3	134.3	134.3	134.3	134.3	134.3	134.3	134.3
FUEL RATE, LB/HR	71.9	72.1	72.1	72.1	72.1	72.1	72.1	72.1	72.1
IGNITION TIMING, DEG BTDC	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
MANIFOLD VACUUM, IN HG	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
THROTTLE ANGLE, DEG	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0
INTAKE MAN. TEMP., F	88	88	88	88	88	88	88	88	88
CONCENTRATIONS, DRY BASIS									
CO, %	6.2900	6.3600	6.5100	6.6200	6.7300	6.8400	6.9500	7.0600	7.1700
CO2, %	10.19	10.30	9.79	10.40	10.50	10.50	11.66	11.66	11.66
O2, %	.07	.04	.04	.04	.04	.04	.04	.04	.04
HC, PPM	1474	1373	1453	1052	982	982	459	459	459
NOX, PPM	435	400	550	500	235	235	250	250	250
AIR/FUEL RATIO	12.09	12.08	12.21	12.36	12.40	12.40	12.40	12.40	12.40
EMISSION RATES, G/HR									
CO	22726.1	22990.8	21685.5	20220.1	16106.9	11852.1			
HC	268.5	250.2	243.9	176.2	148.4	70.2			
NOX+	244.6	225.0	285.1	261.4	109.7	118.2			
OIL TEMPERATURE, F	254	254	251	251	253	253			
OIL PRESSURE, PSI	39	39	39	39	40	40			
COOLANT TEMPERATURE, F	183	183	183	191	189	189			
EXHAUST PRESSURE, IN. H2O	133.0	105.0	124.0	96.0	110.0	84.0			
EXHAUST TEMPERATURE, F	914	1162	936	1232	977	1321			

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE:	7602	42.1	42.2	43.1	43.2	44.1
TEST NUMBER		5/28/76	5/28/76	6/10/76	6/10/76	5/28/76
TEST DATE		745.0	745.0	742.5	742.5	745.0
BAROMETER, MMHG	63	63	64	64	63	63
HUMIDITY, GRAINS/LB						
TEMPERATURE, F	81	81	82	82	79	79
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	193.0	193.0	130.0	130.0	80.0	80.0
POWER, BHP*	80.8	80.8	54.7	54.7	33.4	33.4
FUEL RATE, LB/HR	45.1	45.5	26.9	26.6	22.4	22.5
IGNITION TIMING, DEG BTDC	39.0	39.0	52.0	52.0	50.0	50.0
MANIFOLD VACUUM, IN HG	5.5	5.5	11.0	11.0	14.0	14.0
THROTTLE ANGLE, DEG	24.0	24.0	20.0	20.0	13.0	13.0
INTAKE MAN. TEMP., F	205	205	205	205	207	207

## CONCENTRATIONS, DRY BASIS

CO, %	5.0000	3.6400	7.570	2.416	.1650	.0820
CO2, %	10.09	11.55	11.66	11.66	11.01	10.90
O2, %	1.55	.80	3.00	3.50	5.00	5.25
HC, PPM	783	280	620	360	726	390
NOX, PPM	195	175	950	900	510	525
AIR/FUEL RATIO	13.48	13.72	16.79	17.61	19.06	19.46

## EMISSION RATES, G/HR

CO	12614.4	9345.5	1408.3	467.2	291.3	148.3
HC	99.6	36.3	58.1	35.0	64.6	35.6
NOX+	76.6	69.9	277.0	272.7	140.1	147.8
OIL TEMPERATURE, F	252	252	227	227	212	212
OIL PRESSURE, PSI	41	41	45	45	55	55
COOLANT TEMPERATURE, F	195	195	187	187	191	191
EXHAUST PRESSURE, IN. H2O	83.0	59.0	38.0	25.0	27.0	20.0
EXHAUST TEMPERATURE, F	896	1101	790	1020	661	882

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE	5/28/76	45.1	45.2	46.1	46.2	47.1	47.2
BAROMETER, MMHG	745.0	745.0	742.5	742.5	745.0	745.0	745.0
HUMIDITY, GRAINS/LB	63	63	64	64	63	63	63
TEMPERATURE, F	80	80	87	87	87	87	87
ENGINE SPEED, RPM	2200	2200	2200	2200	2600	2600	2600
TORQUE, FT-LB	33.0	33.0	1.5	1.5	307.0	307.0	307.0
POWER, BHP*	13.8	13.8	.6	.6	152.7	152.7	152.7
FUEL RATE, LB/HR	16.3	16.2	13.8	13.7	80.8	81.3	81.3
IGNITION TIMING, DEG BTDC	48.0	48.0	53.0	53.0	28.0	28.0	28.0
MANIFOLD VACUUM, IN HG	17.0	17.0	19.5	19.5	1.7	1.7	1.7
THROTTLE ANGLE, DEG	10.0	10.0	9.5	9.5	79.0	79.0	79.0
INTAKE MAN. TEMP., F	210	210	178	178	89	89	89

## CONCENTRATIONS, DRY BASIS

CO, %	151.1	079.6	233.5	098.8	5.6700	5.8000
CO2, %	9.99	10.09	9.31	9.60	10.60	10.60
O2, %	6.60	6.50	8.00	7.60	.08	.07
HC, PPM	1382	995	6593	3854	1545	1362
NOX, PPM	200	200	45	63	580	480
AIR/FUEL RATIO	20.87	20.88	21.44	21.62	12.35	12.32
EMISSION RATES, G/HR						
CO	213.3	112.2	288.5	122.3	23453.7	24068.4
HC	98.3	70.7	410.6	240.4	322.1	285.0
NOX+	43.9	43.9	8.7	12.2	373.3	310.0
OIL TEMPERATURE, F	232	232	204	204	257	257
OIL PRESSURE, PSI	50	50	63	63	44	44
COOLANT TEMPERATURE, F	187	187	178	178	189	189
EXHAUST PRESSURE, IN. H2O	22.0	14.0	16.0	16.0	154.0	154.0
EXHAUST TEMPERATURE, F	742	934	432	885	1002	1235

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE:	7602	48.1	48.2	49.1	49.2	50.1	50.2
TEST NUMBER	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
TEST DATE	745.0	745.0	745.0	745.0	745.0	745.0	745.0
BAROMETER, MMHG	63	63	63	63	63	63	63
HUMIDITY, GRAINS/LB	82	82	82	82	82	82	82
TEMPERATURE, F	2600	2600	2600	2600	2600	2600	2600
ENGINE SPEED, RPM	276.7	276.7	276.7	276.7	276.7	276.7	276.7
TORQUE, FT-LB	137.0	137.0	137.0	137.0	137.0	137.0	137.0
POWER, BHP*	76.7	76.7	76.7	76.7	76.7	76.7	76.7
FUEL RATE, LB/HR	32.5	32.5	32.5	32.5	32.5	32.5	32.5
IGNITION TIMING, DEG BTDC	3.7	3.7	3.7	3.7	3.7	3.7	3.7
MANIFOLD VACUUM, IN HG	35.5	35.5	35.5	35.5	35.5	35.5	35.5
THROTTLE ANGLE, DEG	84	84	84	84	84	84	84
INTAKE MAN. TEMP., F	151	151	151	151	151	151	151
INTAKE AIR TEMP., F							
CONCENTRATIONS, DRY BASIS							
CO, %	7.0400	6.7900	6.4300	5.5900	6.2100	4.7800	4.7800
CO2, %	9.70	9.89	9.80	10.70	9.50	10.90	10.90
O2, %	.10	.08	.05	.25	.15	.45	.45
HC, PPM	1654	1541	1367	973	1418	829	829
NOX, PPM	490	530	180	220	135	130	130
AIR/FUEL RATIO	11.79	11.89	12.26	12.53	12.64	12.96	12.96
EMISSION RATES, G/HR							
CO	26559.9	25876.8	21962.6	19481.9	18244.9	14217.7	14217.7
HC	314.5	296.1	235.3	171.0	210.0	124.2	124.2
NOX+	287.7	314.3	95.7	119.3	61.7	60.2	60.2
OIL TEMPERATURE, F	255	255	247	247	246	246	246
OIL PRESSURE, PSI	43	43	45	45	45	45	45
COOLANT TEMPERATURE, F	192	192	191	191	195	195	195
EXHAUST PRESSURE, IN. H2O	149.0	110.0	138.0	109.0	108.0	80.0	80.0
EXHAUST TEMPERATURE, F	974	1187	1006	1306	949	1312	1312

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE	5/28/76	51.1	51.2	52.1	52.2	53.1
BAROMETER, MMHG	745.0	745.0	745.0	745.0	745.0	745.0
HUMIDITY, GRAINS/LB	63	63	63	63	63	63
TEMPERATURE, F	82	82	82	82	82	82
ENGINE SPEED, RPM	2600	2600	2600	2600	2600	2600
TORQUE, FT-LB	123.8	123.8	77.0	77.0	31.0	31.0
POWER, BHP*	61.3	61.3	38.1	38.1	15.4	15.4
FUEL RATE, LB/HR	38.7	38.4	27.9	27.6	20.5	20.4
IGNITION TIMING, DEG BTDC	55.0	55.0	56.0	56.0	56.0	56.0
MANIFOLD VACUUM, IN HG	10.6	10.6	14.2	14.2	17.7	17.7
THROTTLE ANGLE, DEG	19.0	19.0	15.0	15.0	11.0	11.0
INTAKE MAN. TEMP., F	205	205	215	215	218	218
CONCENTRATIONS, DRY BASIS						
CO, %	3.0700	1.4800	5754	3756	4400	2789
CO2, %	11.33	12.88	12.13	11.78	11.01	11.01
O2, %	1.55	1.05	2.75	3.45	4.75	4.78
HC, PPM	774	235	187	146	201	151
NOX, PPM	265	240	330	315	110	115
AIR/FUEL RATIO	14.40	14.89	16.69	17.44	18.65	18.84
EMISSION RATES, G/HR						
CO	7051.1	3457.0	1101.8	744.1	697.1	442.3
HC	89.6	27.6	18.0	14.6	16.1	12.1
NOX+	94.7	87.2	98.3	97.1	27.1	28.4
OIL TEMPERATURE, F	244	244	245	245	237	237
OIL PRESSURE, PSI	50	50	53	53	52	52
COOLANT TEMPERATURE, F	191	191	192	192	189	189
EXHAUST PRESSURE, IN. H2O	72.0	48.0	47.0	30.0	27.0	18.0
EXHAUST TEMPERATURE, F	914	1284	894	1132	857	1064

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	54.1	54.2	55.1	55.2	56.1
TEST DATE	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
BAROMETER, MMHG	745.0	745.0	745.0	745.0	745.0
HUMIDITY, GRAINS/LB	63	63	63	63	63
TEMPERATURE, F	83	83	84	84	83
ENGINE SPEED, RPM	2600	3000	3000	3000	3000
TORQUE, FT-LB	8.0	8.0	285.0	285.0	257.0
POWER, BHP*	4.0	4.0	163.1	163.1	147.0
FUEL RATE, LB/HR	17.3	16.8	88.8	90.4	87.0
IGNITION TIMING, DEG BTDC	56.0	56.0	31.0	31.0	36.0
MANIFOLD VACUUM, IN HG	19.8	19.8	2.0	2.0	3.9
THROTTLE ANGLE, DEG	9.0	9.0	79.0	79.0	38.8
INTAKE MAN. TEMP., F	218	218	87	87	79
CONCENTRATIONS, DRY BASIS					
CO, %	418.0	2482	5,9600	5,7900	6,9500
CO2, %	11.00	10.80	10.60	10.50	9.70
O2, %	5.00	5.15	5.10	5.17	.07
HC, PPMC	145	145	1517	1270	1711
NOX, PPM	58	62	695	520	510
AIR/FUEL RATIO	18.90	19.27	12.31	12.37	11.80
EMISSION RATES, G/HR					
CO	565.0	333.0	26516.3	26829.8	29642.7
HC	9.9	9.8	346.1	296.5	367.7
NOX+	12.2	12.9	426.0	375.0	351.8
OIL TEMPERATURE, F	234	234	268	268	266
OIL PRESSURE, PSI	60	60	46	46	45
COOLANT TEMPERATURE, F	189	189	194	194	190
EXHAUST PRESSURE, IN. H2O	22.0	13.0	218.0	194.0	188.0
EXHAUST TEMPERATURE, F	858	1041	1061	1287	1008

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE	5/29/76	5/29/76	57.1	57.2	58.1	58.2	5/10/76	6/10/76	5/29/76	5/29/76	59.1	59.2
BAROMETER, MMHG	736.7	736.7	59	59	64	64	742.5	742.5	736.7	736.7	59	59
HUMIDITY, GRAINS/LB												
TEMPERATURE, F	81	81			87	87					82	82
ENGINE SPEED, RPM	3000	3000			3000	3000					3000	3000
TORQUE, FT-LB	215.0	215.0			173.0	173.0					114.0	114.0
POWER, BHP*	124.0	124.0			99.7	99.7					65.8	65.8
FUEL RATE, LB/HR	79.3	79.3			64.2	64.2					45.8	47.0
IGNITION TIMING, DEG BTDC	47.5	47.5			47.5	47.5					57.0	57.0
MANIFOLD VACUUM, IN HG	6.5	6.5			6.5	6.5					10.0	10.0
THROTTLE ANGLE, DEG	31.5	31.5			31.5	31.5					21.0	21.0
INTAKE MAN. TEMP., F	76	76			76	76					22.3	22.3
<hr/>												
CONCENTRATIONS, DRY BASIS												
CO, %	7.7400	7.6600			6.6000	5.7900					3.8200	2.7200
CO2, %	9.11	9.31			10.09	11.11					11.33	12.26
O2, %	13	13			.07	.75					.88	.50
HC, PPHC	1706	1538			1229	748					725	344
NOX, PPM	375	380			140	170					210	190
AIR/FUEL RATIO			11.48	11.52	12.39	12.55					13.64	13.94
<hr/>												
EMISSION RATES, G/HR												
CO	29529.6	29439.3			21764.2	19178.6					9832.9	7316.1
HC	328.0	297.9			204.2	124.8					94.1	46.6
NOX+	219.1	223.6			72.3	86.2					82.8	78.3
OIL TEMPERATURE, F	265	265			247	247					258	258
OIL PRESSURE, PSI	46	46			47	47					51	51
COOLANT TEMPERATURE, F	192	192			198	198					192	192
EXHAUST PRESSURE, IN. H2O	146.0	118.0			127.0	98.0					94.0	67.0
EXHAUST TEMPERATURE, F	932	1157			997	1325					1037	1384

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	60.1	60.2	61.1	61.2	62.1
TEST DATE	5/29/76	5/29/76	5/29/76	5/29/76	5/29/76
BAROMETER, MMHG	736.7	736.7	736.7	736.7	736.7
HUMIDITY, GRAINS/LB	59	59	59	59	59
TEMPERATURE, F	82	82	82	82	82
ENGINE SPEED, RPM	3000	3000	3000	3000	3000
TORQUE, FT-LB	71.0	71.0	28.4	28.4	4.8
POWER, BHP*	41.0	41.0	16.4	16.4	2.8
FUEL RATE, LB/HR	32.9	33.0	24.6	24.6	2.8
IGNITION TIMING, DEG BTDC	58.0	58.0	58.0	58.0	23.3
MANIFOLD VACUUM, IN HG	14.0	14.0	17.2	17.2	58.0
THROTTLE ANGLE, DEG	16.5	16.5	12.5	12.5	19.0
INTAKE MAN. TEMP., F	222	222	225	225	10.0
					10.0
					235
CONCENTRATIONS, DRY BASIS					
CO, %	.8344	4362	3779	2789	3985
CO2, %	12.62	12.50	11.44	11.55	12.02
O2, %	1.90	2.55	4.20	4.15	2.85
HC, PPM	80	68	101	73	45
NOX, PPM	240	250	115	112	62
AIR/FUEL RATIO	15.85	16.59	18.13	18.15	16.55
EMISSION RATES, G/HR					
CO	1784.7	980.4	694.8	513.6	1409.5
HC	8.6	7.7	9.4	6.8	11.5
NOX+	78.6	86.0	32.4	31.6	14.2
OIL TEMPERATURE, F	252	252	237	237	239
OIL PRESSURE, PSI	55	55	59	59	60
COOLANT TEMPERATURE, F	192	192	191	191	192
EXHAUST PRESSURE, IN. H2O	50.0	42.0	38.0	35.0	20.0
EXHAUST TEMPERATURE, F	992	1266	907	1143	1308

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	63.1	63.2	64.1	64.2	65.1	65.2
TEST DATE	5/29/76	5/29/76	6/10/76	6/10/76	5/29/76	5/29/76
BAROMETER, MMHG	736.7	736.7	742.5	742.5	736.7	736.7
HUMIDITY, GRAINS/LB	59	59	64	64	59	59
TEMPERATURE, F	84	84	87	87	86	86
ENGINE SPEED, RPM	3500	3500	3500	3500	3500	3500
TORQUE, FT-LB	250.9	250.0	227.0	227.0	188.0	188.0
POWER, BHP*	168.7	168.7	152.6	152.6	127.1	127.1
FUEL RATE, LB/HR	98.6	98.8	96.3	95.5	90.4	91.5
IGNITION TIMING, DEG BTDC	34.0	34.0	42.0	42.0	51.5	51.5
MANIFOLD VACUUM, IN HG	2.4	2.4	4.4	4.4	6.2	6.2
THROTTLE ANGLE, DEG	79.0	79.0	54.0	54.0	37.0	37.0
INTAKE MAN. TEMP., F	85	85	82	82	83	83
CONCENTRATIONS, DRY BASIS						
CO, %	5.5400	5.8770	7.8500	7.8800	8.7400	8.5200
CO2, %	10.60	10.50	9.89	9.89	8.74	8.74
O2, %	.11	.09	.10	.08	.10	.07
HC, PPM	1544	1316	1691	1376	1819	1591
NOX, PPM	630	530	500	520	320	315
AIR/FUEL RATIO	12.41	12.30	11.61	11.61	11.11	11.16
EMISSION RATES, G/HR						
CO	28089.1	29604.9	36463.6	36308.0	36911.6	36586.8
HC	394.5	334.1	395.9	319.6	387.2	344.3
NOX+	489.1	408.8	364.0	375.5	206.9	207.1
OIL TEMPERATURE, F	285	252	252	252	279	279
OIL PRESSURE, PSI	46	46	47	47	47	47
COOLANT TEMPERATURE, F	195	195	197	197	193	193
EXHAUST PRESSURE, IN. H2O	252.0	236.0	218.0	194.0	185.0	157.0
EXHAUST TEMPERATURE, F	1106	1328	1049	1254	989	1207

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE:	7602	66.1	66.2	67.1	67.2	68.1	68.2
TEST NUMBER		6/10/76	6/10/76	5/29/76	5/29/76	5/29/76	5/29/76
TEST DATE		742.5	742.5	736.7	736.7	736.7	736.7
BAROMETER, MMHG	64	64	59	59	59	59	59
HUMIDITY, GRAINS/LB	88	88	84	84	100	100	100
TEMPERATURE, F							
ENGINE SPEED, RPM	3500	3500	3500	3500	3500	3500	3500
TORQUE, FT-LB	152.0	152.0	101.0	101.0	62.0	62.0	62.0
POWER, BHP*	102.3	102.3	68.2	68.2	42.4	42.4	42.4
FUEL RATE, LB/HR	76.4	73.4	54.7	54.7	41.7	41.7	41.7
IGNITION TIMING, DEG BTDC	59.0	59.0	60.0	60.0	61.0	61.0	61.0
MANIFOLD VACUUM, IN HG	9.6	9.6	10.0	10.0	13.5	13.5	13.5
THROTTLE ANGLE, DEG	38.2	38.2	24.0	24.0	23.5	23.5	23.5
INTAKE MAN. TEMP., F	86	86	205	205	239	239	239
CONCENTRATIONS, DRY BASIS							
CO, %	8.4500	8.4700	4.2400	3.4200	2.4800	2.4800	2.4800
CO2, %	9.50	9.40	11.11	12.02	12.13	12.13	12.13
O2, %	15	10	6.5	3.0	1.00	1.00	1.00
HC, PPM	1431	1372	657	425	371	371	371
NOX, PPM	420	385	195	185	130	130	128
AIR/FUEL RATIO	11.42	11.36	13.32	13.52	14.36	14.36	14.36
EMISSION RATES, G/HR							
CO	30698.2	29477.8	12756.7	10385.1	6094.7	2422.4	2422.4
HC	262.0	240.7	99.6	65.0	46.0	7.1	7.1
NOX+	239.1	210.0	89.8	86.0	48.9	48.4	48.4
OIL TEMPERATURE, F	236	236	262	262	247	247	247
OIL PRESSURE, PSI	52	52	53	53	57	57	57
COOLANT TEMPERATURE, F	191	191	193	193	192	192	192
EXHAUST PRESSURE, IN. H2O	135.0	106.0	113.0	84.0	83.0	57.0	57.0
EXHAUST TEMPERATURE, F	951	1179	1067	1404	1092	1508	1508

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY



## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	72.1	72.2	73.1	73.2	74.1	74.2
TEST DATE	6/ 1/76	6/ 1/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
BAROMETER, MMHG	745.0	745.0	744.0	744.0	744.0	744.0
HUMIDITY, GRAINS/LB	64	64	64	64	64	64
TEMPERATURE, F	84	84	84	84	84	84
ENGINE SPEED, RPM	650	650	650	650	750	750
TORQUE, FT-LB	10.0	10.0	20.0	20.0	1.4	1.4
POWER, BHP*	1.2	1.2	2.5	2.5	.2	.2
FUEL RATE, LB/HR	4.1	4.1	4.3	4.1	4.2	4.2
IGNITION TIMING, DEG BTDC	37.0	37.0	39.0	39.0	39.5	39.5
MANIFOLD VACUUM, IN HG	19.5	19.5	19.5	19.5	20.5	20.5
THROTTLE ANGLE, DEG	5	5	5	5	0	0
INTAKE MAN. TEMP., F	142	142	118	118	121	121
CONCENTRATIONS, DRY BASIS						
CO, %	3.390	1.229	6.276	1.741	5.926	1811
CO2, %	12.25	12.75	12.75	12.75	11.78	12.26
O2, %	15.00	4.00	1.75	2.05	3.45	3.05
HC, PPM	16955	8506	9100	6239	19725	11294
NOX, PPM	55	58	89	49	35	25
AIR/FUEL RATIO	23.22	16.75	14.84	15.59	14.91	15.75
EMISSION RATES, G/HR						
CO	131.2	34.7	163.3	46.3	153.8	49.9
HC	330.7	121.2	119.3	83.5	258.1	157.0
NOX+	3.3	2.6	3.3	1.7	1.4	1.1
OIL TEMPERATURE, F						
OIL PRESSURE, PSI	189	189	185	185	189	189
COOLANT TEMPERATURE, F	26	26	27	27	29	29
EXHAUST PRESSURE, IN. H2O	186	186	187	187	182	182
EXHAUST TEMPERATURE, F	5.0	3.0	2.0	2.0	2.0	2.0
	407	527	422	503	412	527

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

## TEST NUMBER

TEST DATE	75.1	75.2	76.1	76.2	77.1
BAROMETER, MMHG	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
HUMIDITY, GRAINS/LB	744.0	744.0	744.0	744.0	744.0
TEMPERATURE, F	64	64	64	64	64
ENGINE SPEED, RPM	84	84	88	88	82
TORQUE, FT-LB	750	750	750	750	850
POWER, BHP*	10.0	10.0	20.0	20.0	308.0
FUEL RATE, LB/HR	1.4	1.4	2.9	2.9	49.9
IGNITION TIMING, DEG BTDC	4.5	4.5	4.8	4.8	24.5
MANIFOLD VACUUM, IN HG	40.0	40.0	40.0	40.0	15.0
THROTTLE ANGLE, DEG	20.2	20.2	19.5	19.5	0.0
INTAKE MAN. TEMP., F	.5	.5	1.0	1.0	79.0
INTAKE MAN. TEMP., F	121	121	123	123	94
CONCENTRATIONS, DRY BASIS					
CO, %	4400	1263	2533	0844	4.5000
CO2, %	12.13	12.26	12.26	12.50	11.44
O2, %	3.10	3.25	2.85	2.90	20
HC, PPM	16947	10161	11299	5090	1694
NOX, PPM	55	45	100	95	1100
AIR/FUEL RATIO	15.04	16.06	15.57	16.43	12.89
EMISSION RATES, G/HR					
CO	123.3	37.7	78.3	27.4	6019.2
HC	239.4	152.8	176.1	83.2	125.4
NOX+	2.4	2.1	4.8	4.8	226.4
OIL TEMPERATURE, F	191	191	191	191	208
OIL PRESSURE, PSI	29	29	29	29	25
COOLANT TEMPERATURE, F	182	182	188	188	201
EXHAUST PRESSURE, IN. H2O	5.0	0	5.0	0	22.0
EXHAUST TEMPERATURE, F	425	539	434	542	722

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 4000 CID

EINHEITSCODE: 7602

FOEL COVE - FORT NUMERO

E31 NUMBER

TEST DATE

BARTHET, M.H.G.

HUMIDITY, GRAINS/LB

THE STATE

K8833863

ט' ט' ט' ט'

**TORQUE, FT-LB**  
**POWER, BHP\***  
**FUEL RATE, LB/HR**  
**IGNITION TIMING, DEG BTDC**  
**MANIFOLD VACUUM, IN HG**  
**THROTTLE ANGLE, DEG**  
**INTAKE MAN. TEMP., F**

## CONCENTRATIONS, DRY BASIS

CO <sub>x</sub> , %	1.3300
CO <sub>2</sub> , %	12.02
O <sub>2</sub> , %	2.18
HC, PPM	1191
NO <sub>x</sub> , PPM	450

115 . 69

### EMISSION RATES, G/HR

OIL TEMPERATURE, F  
OIL PRESSURE, PSI  
COOLANT TEMPERATURE, F  
EXHAUST PRESSURE, IN. H2O  
EXHAUST TEMPERATURE, F

78.1	78.2	79.1	79.2	80.1
6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
744.0	744.0	744.0	744.0	744.0
64	64	64	64	64
84	84	85	85	83
850	850	850	850	850
234.0	234.0	123.0	123.0	77.0
38.0	38.0	20.0	20.0	12.5
17.8	18.1	10.1	9.9	7.9
14.5	14.5	42.5	42.5	43.0
2.5	2.5	12.0	12.0	16.5
22.0	22.0	7.0	7.0	4.0
157	157	149	149	125
1.3300	1.3300	0561	0378	0748
12.02	12.75	11.01	11.11	10.60
2.18	1.84	5.00	4.85	5.90
1191	740	1127	720	1111
450	400	1000	855	475
15.69	15.77	19.11	19.03	20.05
1524.0	891.1	44.7	29.6	47.4
68.8	43.6	45.2	28.4	35.5
80.7	73.2	124.8	104.7	47.1
206	206	201	201	199
36	36	27	27	29
186	186	186	186	186
19.0	10.0	8.0	4.0	5.0
736	924	569	682	511

\* \* CORRECTED SAE J816B  
\* \* CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	81.1	81.2	82.1	82.2	84.1
TEST DATE	6/ 3/76	6/ 3/76	6/14/76	6/14/76	6/14/76
BAROMETER, MMHG	744.0	744.0	737.7	737.7	737.7
HUMIDITY, GRAINS/LB	64	64	67	67	67
TEMPERATURE, F	83	83	87	87	84
ENGINE SPEED, RPM	850	850	1000	1000	1000
TORQUE, FT-LB	33.0	33.0	292.0	292.0	117.0
POWER, BHP*	5.4	5.4	56.5	56.5	22.6
FUEL RATE, LB/HR	6.0	6.0	26.8	26.8	9.8
IGNITION TIMING, DEG BTDC	42.0	42.0	17.0	17.0	45.0
MANIFOLD VACUUM, IN HG	19.5	19.5	0.0	0.0	16.0
THROTTLE ANGLE, DEG	2.0	2.0	79.0	79.0	5.5
INTAKE MAN. TEMP., F	121	121	111	111	137
<hr/>					
CONCENTRATIONS, DRY BASIS					
CO, %	17.21	0748	3.3000	2.7200	.2890
CO2, %	13.01	13.01	12.87	13.26	10.90
O2, %	2.50	2.40	1.1	1.1	5.12
HC, PPMC	8529	2841	1156	1070	1172
NOX, PPM	210	195	1250	1375	410
AIR/FUEL RATIO	15.65	16.29	13.49	13.74	19.01
<hr/>					
EMISSION RATES, G/HR					
CO	66.4	30.0	4859.2	4030.4	221.6
HC	165.8	57.3	85.8	79.9	45.3
NOX+	12.7	12.2	291.4	322.5	49.8
OIL TEMPERATURE, F	196	196	225	225	190
OIL PRESSURE, PSI	30	30	25	25	35
COOLANT TEMPERATURE, F	186	186	190	190	178
EXHAUST PRESSURE, IN. H2O	5.0	0	24.0	16.0	8.0
EXHAUST TEMPERATURE, F	478	563	745	870	553

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	85.1	85.2	86.1	86.2	87.1
TEST DATE	6/14/76	6/14/76	6/14/76	6/14/76	6/11/76
BAROMETER, MMHG	737.7	737.7	737.7	737.7	740.7
HUMIDITY, GRAINS/LB	67	67	67	67	71
TEMPERATURE, F	84	84	83	83	86
ENGINE SPEED, RPM	1000	1000	1000	1000	1600
TORQUE, FT-LB	74.9	74.9	29.9	29.9	339.0
POWER, BHP*	14.3	14.3	5.6	5.6	101.7
FUEL RATE, LB/HR	8.2	8.4	6.3	6.5	52.7
IGNITION TIMING, DEG BTDC	44.5	44.5	44.5	44.5	23.0
MANIFOLD VACUUM, IN HG	17.5	17.5	20.0	20.0	0.0
THROTTLE ANGLE, DEG	4.0	4.0	3.0	3.0	79.0
INTAKE MAN. TEMP., F	129	129	121	121	92

## CONCENTRATIONS, DRY BASIS

CO, %	1084	10561	11132	5538	66400
CO2, %	9.89	10.35	9.11	9.60	10.09
O2, %	7.00	6.37	8.00	7.50	0.5
HC, PPM	3312	998	10412	4293	1429
NOX, PPM	190	215	100	120	325
AIR/FUEL RATIO	20.97	20.65	20.92	21.49	11.90
EMISSION RATES, G/HR					
CO	77.2	40.2	62.9	31.2	17362.4
HC	119.0	36.0	291.8	125.6	188.4
NOX+	21.4	24.4	8.8	11.0	137.1
OIL TEMPERATURE, F	185	185	184	184	230
OIL PRESSURE, PSI	37	37	40	40	32
COOLANT TEMPERATURE, F	174	174	172	172	192
EXHAUST PRESSURE, IN. H2O	5.0	2.0	5.0	2.0	50.0
EXHAUST TEMPERATURE, F	527	618	472	613	882

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	88.1	88.2	89.1	89.2	90.1	90.2
TEST DATE	6/11/76	6/11/76	6/11/76	6/11/76	6/11/76	6/11/76
BAROMETER, MMHG	740.7	740.7	740.7	740.7	740.7	740.7
HUMIDITY, GRAINS/LB	71	71	71	71	71	71
TEMPERATURE, F	88	88	87	87	87	87
ENGINE SPEED, RPM	1600	1600	1600	1600	1600	1600
TORQUE, FT-LB	248.0	248.0	132.0	132.0	83.0	83.0
POWER, BHP*	76.6	76.6	40.7	40.7	25.6	25.6
FUEL RATE, LB/HR	38.9	38.9	20.9	20.5	16.6	16.6
IGNITION TIMING, DEG BTDC	24.0	24.0	50.0	50.0	47.0	47.0
MANIFOLD VACUUM, IN HG	3.0	3.0	11.0	11.0	14.0	14.0
THROTTLE ANGLE, DEG	34.0	34.0	16.0	16.0	12.0	12.0
INTAKE MAN. TEMP., F	156	156	191	191	184	184
CONCENTRATIONS, DRY BASIS						
CO, %	4.6800	3.3800	1.560	.0675	.0988	.0493
CO2, %	10.50	11.78	11.66	11.55	10.69	10.90
O2, %	1.25	.50	3.65	3.95	5.00	4.95
HC, PPM	967	458	730	392	779	334
NOX, PPM	210	215	960	890	370	360
AIR/FUEL RATIO	13.44	13.63	17.74	18.14	19.23	19.23
EMISSION RATES, G/HR						
CO	10129.7	7372.3	238.2	103.7	130.8	65.1
HC	105.5	50.3	56.2	30.4	51.9	22.2
NOX+	73.4	75.7	236.6	220.8	79.0	76.7
OIL TEMPERATURE, F	224	224	214	214	206	206
OIL PRESSURE, PSI	35	35	40	40	45	45
COOLANT TEMPERATURE, F	191	191	186	186	185	185
EXHAUST PRESSURE, IN. H2O	69.0	40.0	27.0	27.0	19.0	11.0
EXHAUST TEMPERATURE, F	885	1231	742	906	696	696

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	91-1	91-2	92-1	92-2	93-1	93-2
TEST DATE	6/14/76	6/14/76	6/16/76	6/16/76	6/14/76	6/14/76
BAROMETER, MMHG	737.7	737.7	741.1	741.1	737.7	737.7
HUMIDITY, GRAINS/LB	67	67	61	61	67	67
TEMPERATURE, F	81	81	85	85	88	88
ENGINE SPEED, RPM	1600	1600	1800	1800	1800	1800
TORQUE, FT-LB	33.0	33.0	335.0	335.0	249.0	249.0
POWER, BHP*	10.2	10.2	115.7	115.7	86.8	86.8
FUEL RATE, LB/HR	11.9	11.9	58.5	58.6	44.4	44.4
IGNITION TIMING, DEG BTDC	52.0	52.0	25.0	25.0	26.0	26.0
MANIFOLD VACUUM, IN HG	18.0	18.0	5.5	5.5	3.0	3.0
THROTTLE ANGLE, DEG	8.0	8.0	79.0	79.0	36.0	36.0
INTAKE MAN. TEMP., F	153	153	92	92	168	168
CONCENTRATIONS, DRY BASIS						
CO, %	1373	9748	7.5200	6.5400	4.7800	3.3000
CO2, %	9.79	9.97	10.29	10.29	10.39	12.01
O2, %	7.00	6.50	.07	.07	1.20	.40
HC, PPM	2758	1326	1724	1718	1058	470
NOX, PPM	100	107	400	400	250	245
AIR/FUEL RATIO	21.10	20.89	11.75	12.02	13.35	13.62
EMISSION RATES, G/HR						
CO	143.3	77.3	21413.6	19126.4	11754.5	8202.1
HC	145.1	69.0	247.5	253.2	131.1	58.9
NOx+	16.5	17.5	176.3	181.0	97.3	96.4
OIL TEMPERATURE, F						
OIL PRESSURE, PSI	192	192	245	245	231	231
COOLANT TEMPERATURE, F	150	50	35	35	36	36
EXHAUST PRESSURE, IN. H2O	187	187	194	194	196	196
EXHAUST TEMPERATURE, F	13.0	7.0	88.0	64.0	72.0	49.0
	646	614	888	1080	906	1270

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	94.1	94.2	95.1	95.2	96.1	96.2
TEST DATE	6/14/76	6/14/76	6/14/76	6/14/76	6/14/76	6/14/76
BAROMETER, MMHG	737.7	737.7	737.7	737.7	745.8	745.8
HUMIDITY, GRAINS/LB	67	67	67	67	59	59
TEMPERATURE, F	88	88	86	86	82	82
ENGINE SPEED, RPM	1800	1800	1800	1800	1800	1800
TORQUE, FT-LB	133.0	133.0	84.0	84.0	33.0	33.0
POWER, BHP*	46.3	46.3	29.2	29.2	11.3	11.3
FUEL RATE, LB/HR	23.1	22.2	17.6	18.0	13.3	13.4
IGNITION TIMING, DEG BTDC	49.0	49.0	52.0	52.0	51.0	51.0
MANIFOLD VACUUM, IN HG	11.0	11.0	14.5	14.5	17.7	17.7
THROTTLE ANGLE, DEG	17.0	17.0	13.0	13.0	10.0	10.0
INTAKE MAN. TEMP., F	204	204	186	186	178	178
CONCENTRATIONS, DRY BASIS						
CO, %	20.11	10.12	0.988	0.515	151.1	074.8
CO2, %	12.25	12.13	11.21	11.21	9.70	9.79
O2, %	3.80	4.00	5.30	5.20	7.00	6.75
HC, PPM	723	293	335	268	220.5	132.3
NOX, PPM	975	825	400	375	130	150
AIR/FUEL RATIO	17.69	18.01	19.37	19.34	21.26	21.24
EMISSION RATES, G/HR						
CO	336.9	166.5	139.1	74.0	177.5	88.8
HC	61.0	24.3	23.8	19.4	130.6	79.2
NOX+	256.6	214.9	89.2	65.2	23.4	27.3
OIL TEMPERATURE, F	227	227	208	208	202	202
OIL PRESSURE, PSI	40	40	45	45	53	53
COOLANT TEMPERATURE, F	191	191	192	192	178	178
EXHAUST PRESSURE, IN. H2O	30.0	18.0	22.0	13.0	16.0	8.0
EXHAUST TEMPERATURE, F	742	924	697	875	672	847

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	97.1	97.2	98.1	98.2	99.1	99.2
TEST DATE	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
BAROMETER, MMHG	745.8	745.8	745.8	745.8	745.8	745.8
HUMIDITY, GRAINS/LB	59	59	59	59	59	59
TEMPERATURE, F	84	84	85	85	87	87
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	324.0	324.0	244.0	244.0	130.0	130.0
POWER, BHP*	135.8	135.8	102.3	102.3	54.6	54.6
FUEL RATE, LB/HR	70.1	70.2	55.0	55.9	31.5	30.7
IGNITION TIMING, DEG BTDC	26.0	26.0	28.0	28.0	53.0	53.0
MANIFOLD VACUUM, IN HG	5	5	3.0	3.0	11.0	11.0
THROTTLE ANGLE, DEG	79.0	79.0	44.0	44.0	21.0	21.0
INTAKE MAN. TEMP., F	98	98	162	162	221	221
<hr/>						
CONCENTRATIONS, DRY BASIS						
CO, %	5.8600	5.7800	3.8600	2.0300	8344	
CO2, %	10.50	10.50	11.66	11.66	12.26	
O2, %	12	10	92	32	2.15	2.30
HC, PPM	1430	1293	1114	527	681	295
NOX, PPM	750	600	345	370	530	515
AIR/FUEL RATIO	12.32	12.33	12.82	13.33	15.35	16.16
<hr/>						
EMISSION RATES, G/HR						
CO	20963.0	20801.7	16872.8	11840.9	4042.3	1699.2
HC	257.9	233.6	163.9	81.5	68.4	30.3
NOX+	411.2	329.8	154.4	174.0	161.8	160.7
OIL TEMPERATURE, F	249	249	232	232	222	222
OIL PRESSURE, PSI	38	38	43	43	49	49
COOLANT TEMPERATURE, F	199	199	181	181	172	172
EXHAUST PRESSURE, IN. H2O	127.0	100.0	108.0	89.0	49.0	32.0
EXHAUST TEMPERATURE, F	935	1155	972	1316	842	1146

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602	TEST NUMBER	100.1	100.2	100.1	100.2	100.1	100.2
TEST DATE	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
BAROMETER, MMHG	745.8	745.8	745.8	745.8	745.8	745.8	745.8
HUMIDITY, GRAINS/LB	59	59	59	59	59	59	59
TEMPERATURE, F	85	85	85	85	85	86	86
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	81.0	81.0	32.0	32.0	32.0	308.0	308.0
POWER, BHP*	34.0	34.0	13.4	13.4	13.4	152.8	152.8
FUEL RATE, LB/HR	22.6	22.7	17.1	16.6	82.2	82.5	82.5
IGNITION TIMING, DEG BTDC	53.5	53.5	54.0	54.0	54.0	29.0	29.0
MANIFOLD VACUUM, IN HG	14.0	14.0	17.5	17.5	17.5	1.0	1.0
THROTTLE ANGLE, DEG	16.0	16.0	12.0	12.0	12.0	79.0	79.0
INTAKE MAN. TEMP., F	221	221	215	215	215	96	96
CONCENTRATIONS, DRY BASIS							
CO, %	2750	1511	2243	0892	5.9400	5.9400	5.9400
CO2, %	11.22	11.11	10.09	10.30	10.40	10.40	10.40
O2, %	4.55	4.88	6.25	6.00	12	12	10
HC, PPM	487	296	1107	332	1429	1426	1426
NOX, PPN	510	470	165	175	625	540	540
AIR/FUEL RATIO	18.54	19.00	20.45	20.41	12.27	12.27	12.27
EMISSION RATES, G/HR							
CO	475.7	269.1	325.7	125.8	24855.3	24932.8	24932.8
HC	42.4	26.6	81.0	23.6	301.4	263.7	263.7
NOX+	135.2	128.3	36.7	37.8	400.8	347.4	347.4
OIL TEMPERATURE, F	211	211	207	207	259	259	259
OIL PRESSURE, PSI	58	58	64	64	42	42	42
COOLANT TEMPERATURE, F	163	163	161	161	201	201	201
EXHAUST PRESSURE, IN. H2O	33.0	21.0	22.0	14.0	171.0	140.0	140.0
EXHAUST TEMPERATURE, F	768	972	737	926	1012	1226	1226

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	103.1	103.2	104.1	104.2	105.1
TEST DATE	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 5/76
BAROMETER, MMHG	745.8	745.8	745.8	745.8	747.6
HUMIDITY, GRAINS/LB	59	59	59	59	56
TEMPERATURE, F	85	85	87	87	81
ENGINE SPEED, RPM	2600	2600	2600	2600	2600
TORQUE, FT-LB	231.0	231.0	123.0	123.0	77.0
POWER, BHP*	114.5	114.5	61.1	61.1	37.9
FUEL RATE, LB/HR	66.5	67.9	41.7	41.1	27.3
IGNITION TIMING, DEG BTDC	38.5	39.5	55.0	55.0	28.1
MANIFOLD VACUUM, IN HG	3.0	3.0	11.0	11.0	54.0
THROTTLE ANGLE, DEG	39.0	39.0	25.0	25.0	14.5
INTAKE MAN. TEMP., F	159	159	201	201	18.0
AIR/FUEL RATIO	12.36	12.62	13.20	13.72	16.69
CONCENTRATIONS, DRY BASIS					
CO, %	6.2700	5.3700	5.3600	3.5500	6.816
CO2, %	9.99	10.70	9.50	11.55	4570
O2, %	.55	.25	1.60	.77	11.90
HC, PPM	1255	772	1047	429	3.27
NOX, PPM	280	290	145	160	141
				290	270
EMISSION RATES, G/HR					
CO	21413.0	19045.8	12760.0	8241.8	1277.2
HC	215.9	138.0	121.1	50.2	15.0
NOX+	146.6	157.6	51.0	56.9	82.2
OIL TEMPERATURE, F	249	249	216	216	226
OIL PRESSURE, PSI	46	46	58	58	54
COOLANT TEMPERATURE, F	188	188	179	179	195
EXHAUST PRESSURE, IN. H2O	138.0	109.0	72.0	49.0	44.0
EXHAUST TEMPERATURE, F	1022	1321	821	1261	885

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	106.1	106.2	107.1	107.2	108.1
TEST DATE	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76
BAROMETER, MMHG	747.6	747.6	747.6	747.6	747.6
HUMIDITY, GRAINS/LB	56	56	56	56	56
TEMPERATURE, F	81	81	81	82	82
ENGINE SPEED, RPM	2600	2600	3000	3000	3000
TORQUE, FT-LB	31.0	31.0	290.0	290.0	218.0
POWER, BHP*	15.3	15.3	164.7	164.7	123.9
FUEL RATE, LB/HR	22.2	21.3	91.8	91.7	81.8
IGNITION TIMING, DEG BTDC	55.0	55.0	30.0	30.0	47.0
MANIFOLD VACUUM, IN HG	18.5	18.5	2.0	2.0	6.5
THROTTLE ANGLE, DEG	13.0	13.0	79.0	79.0	44.0
INTAKE MAN. TEMP., F	205	205	88	88	79
<hr/>					
CONCENTRATIONS, DRY BASIS					
CO, %	6276	3756	6.0000	5.8800	8.5200
CO2, %	11.33	11.22	10.50	10.30	8.92
O2, %	4.00	4.20	1.0	.08	.07
HC, PPM	202	168	1546	1268	1422
NOX, PPM	75	95	665	600	330
AIR/FUEL RATIO	17.78	18.19	12.25	12.26	11.23
<hr/>					
EMISSION RATES, G/HR					
CO	1020.0	601.6	27957.0	27473.7	32862.5
HC	16.6	13.6	363.0	298.5	320.8
NOX+	18.4	23.0	468.7	424.0	192.5
OIL TEMPERATURE, F	211	211	279	279	277
OIL PRESSURE, PSI	60	60	44	44	45
COOLANT TEMPERATURE, F	189	189	205	205	199
EXHAUST PRESSURE, IN. H2O	27.0	18.0	216.0	150.0	149.0
EXHAUST TEMPERATURE, F	888	1107	1062	1289	949
<hr/>					

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER	109.1	109.2	110.1	110.2	111.1
TEST DATE	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76
BAROMETER, MMHG	747.6	747.6	747.6	747.6	747.6
HUMIDITY, GRAINS/LB	56	56	56	56	56
TEMPERATURE, F	82	82	82	82	82
ENGINE SPEED, RPM	3000	3000	3000	3000	3000
TORQUE, FT-LB	117.0	117.0	52.5	52.5	29.0
POWER, BHP*	66.5	66.5	29.8	29.8	16.5
FUEL RATE, LB/HR	47.6	47.6	29.7	30.0	24.9
IGNITION TIMING, DEG BTDC	48.0	48.0	57.5	57.5	57.5
MANIFOLD VACUUM, IN HG	10.5	10.5	15.5	15.5	17.3
THROTTLE ANGLE, DEG	28.0	28.0	18.5	18.5	15.5
INTAKE MAN. TEMP., F	211	211	233	233	239

## CONCENTRATIONS, DRY BASIS

CO, %	4.7800	3.3800	7325	4619	3468
CO2, %	10.50	11.90	12.13	11.90	11.44
O2, %	.90	.25	2.60	2.95	4.08
HC, PPM	831	264	74	96	107
NOX, PPM	170	205	160	160	120
AIR/FUEL RATIO	13.19	13.50	16.48	16.96	18.06
EMISSION RATES, G/HR					
CO	12492.2	8971.2	1474.7	966.9	642.5
HC	109.5	35.3	7.5	10.1	7.4
NOX+	67.2	92.3	48.7	50.7	33.6
OIL TEMPERATURE, F	259	259	237	237	234
OIL PRESSURE, PSI	54	54	61	61	61
COOLANT TEMPERATURE, F	189	189	178	178	178
EXHAUST PRESSURE, IN. H2O	94.0	68.0	52.0	34.0	26.0
EXHAUST TEMPERATURE, F	1033	1406	976	1224	918

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY



HE 18.5-A34  
no.DOT-TSC-  
NHTSA-

78-12 BORROW

Form DOT F-1  
FORMERLY FORM



00347260

**U. S. DEPARTMENT OF TRANSPORTATION  
TRANSPORTATION SYSTEMS CENTER  
KENDALL SQUARE, CAMBRIDGE, MA. 02142**

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300



POSTAGE AND FEES PAID

U. S. DEPARTMENT OF TRANSPORTATION

513